September

P.M. 650

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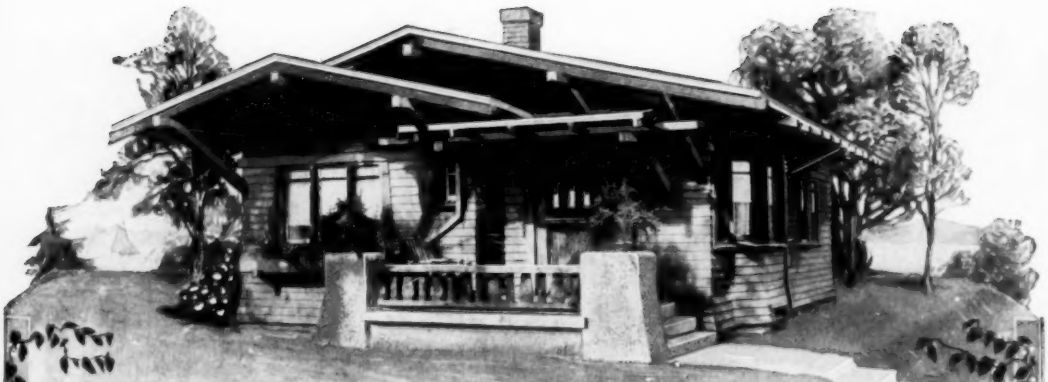
POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

AUG 19 1925
UNIV. OF MICH.

BIG PHONOGRAPH FOR PARK CONCERTS



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$789

Five big well arranged rooms and bath.

Harris Home Design E-181

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It is exclusive with us—the Pioneer of the gigantic "Direct-To-You" Home Building Industry—different from all other plans and methods. We have passed through the stage of experimentation—the questionable schemes and doubtful methods flourishing today were, tested and tried by our experts, and sentenced to the scrap heap, years ago.

$1072

Seven rooms, bath, sleeping and sun porches.

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The Bungalow Above

(Harris Home Design E-183)

Your dream of a home is fully realized in this charming bungalow. Those features, which have made this type so popular, are splendidly harmonized with utility and economy, in this design. Nothing lacking anywhere—and a price you'll be glad to pay. Artistic, novel exterior treatment. Five spacious rooms and bath—strictly modern interior arrangement and finish.

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The Sensibly Cut-To-Fit material used in building this and all other Harris Homes is prepared in a common sense, easily understood manner, with positive accuracy and complete elimination of waste. Better material at a much lower cost to you, easily handled with a big saving in labor and time—some of the many advantages, which are yours, if you build "THE HARRIS WAY."

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Let us help you solve your home building problems. Capable architects are at your command here the year round. Give us an idea of the home you have in mind, in your own words. Include a rough pencil sketch of the arrangement of rooms. That's all we require to inform you fully with plans and all details.

$620

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Harris Home Design E-185

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Popular Mechanics Magazine

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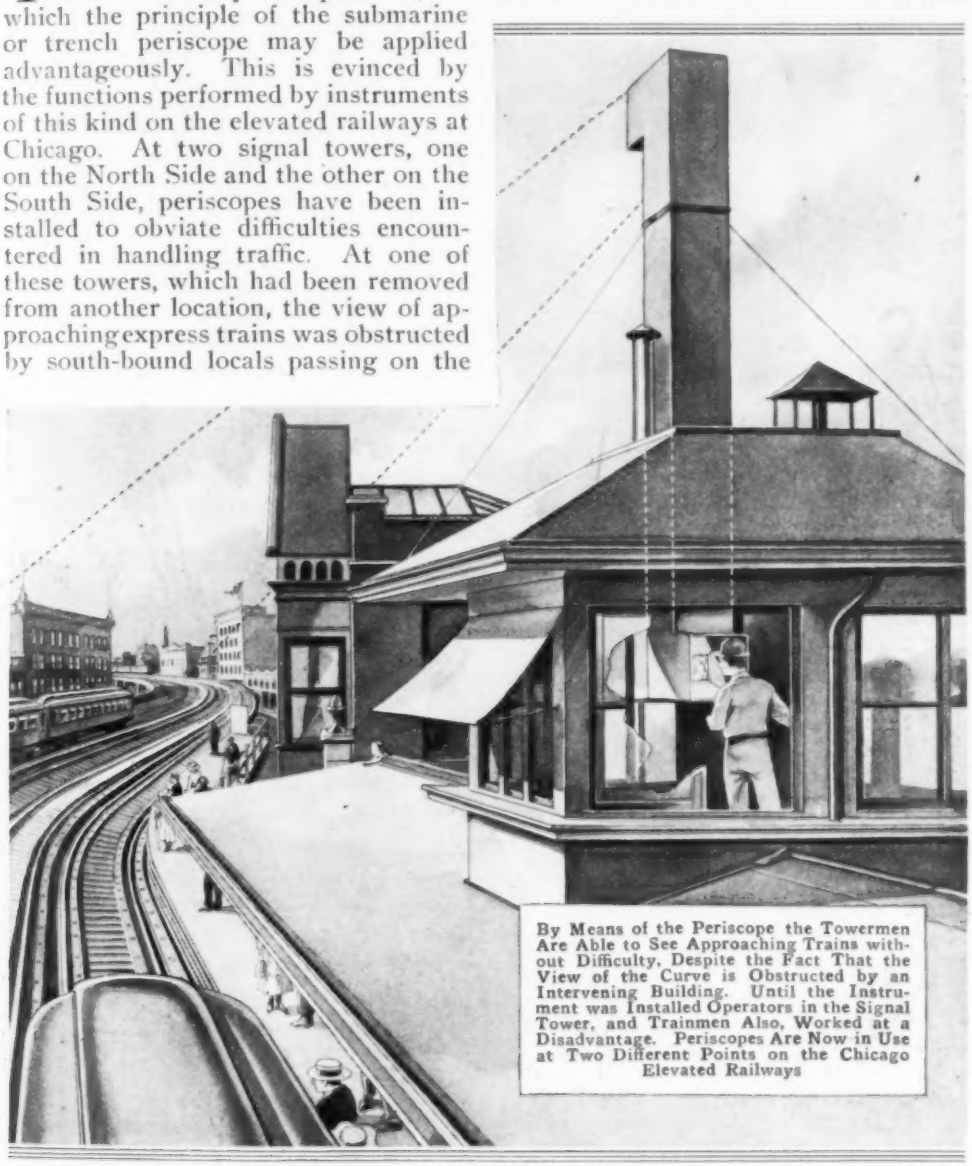
WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 26 SEPTEMBER, 1916 No. 3

Approaching Trains Seen through Periscopes

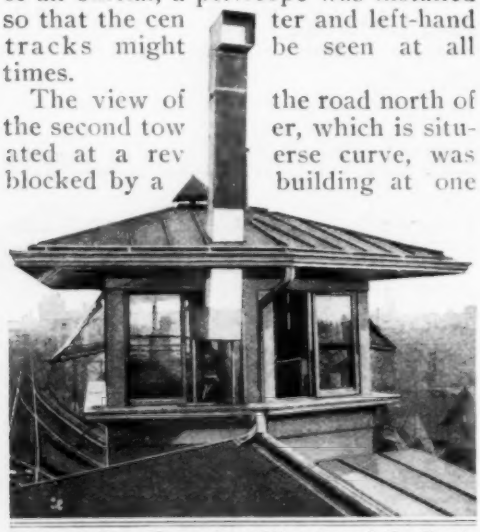
THERE are several purposes, as useful as they are peaceful, to which the principle of the submarine or trench periscope may be applied advantageously. This is evinced by the functions performed by instruments of this kind on the elevated railways at Chicago. At two signal towers, one on the North Side and the other on the South Side, periscopes have been installed to obviate difficulties encountered in handling traffic. At one of these towers, which had been removed from another location, the view of approaching express trains was obstructed by south-bound locals passing on the outer right-hand track, a condition which confused trainmen and tower-



By Means of the Periscope the Towermen Are Able to See Approaching Trains without Difficulty, Despite the Fact That the View of the Curve is Obstructed by an Intervening Building. Until the Instrument was Installed Operators in the Signal Tower, and Trainmen Also, Worked at a Disadvantage. Periscopes Are Now in Use at Two Different Points on the Chicago Elevated Railways

men alike. Finally, at the suggestion of an official, a periscope was installed so that the center and left-hand tracks might be seen at all times.

The view of the road north of the second tower, which is situated at a reverse curve, was blocked by a building at one side of the elevated structure. Another periscope was constructed so that operators in this tower might look over the intervening building and see approaching trains. As in the instance previously mentioned, the instrument has met the problem satisfactorily. The shaft of each of these periscopes is made of sheet metal and fitted with two plate mirrors, 15 in. square, set at angles of 45 degrees.



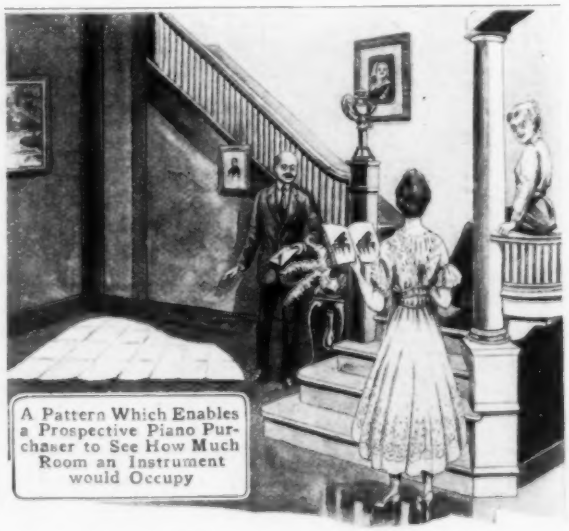
Although There Is an Open View toward the South, This Tower, Until the Periscope was Installed, Afforded Signal Operators No Glimpse of the Track North

TEN-DOLLAR BUFFALO ROBE NOW WORTH BIG SUM

One of the changes incident to the settling up of the great western plains and the consequent killing off of many roaming herds of buffalo has been the great increase in the price of buffalo robes. A patron of a large mail-order house located in the central west, recently visited it bringing with him a huge buffalo pelt which he purchased from the house 38 years ago for $10. Needless to say such robes are not sold by mail-order concerns today. This particular robe is today worth several hundred dollars.

PAPER PATTERNS AN AID IN SELLING PIANOS

Paper patterns of pianos are now being used by a New York piano manufacturer to assist in the sale of baby grand pianos and player grand pianos. Each pattern is made of the same quality of paper as are dress patterns and shows the exact size and shape of the top of the musical instrument it represents. These sheets are given free to prospective customers with the twofold object of enabling one to determine the place in a house or apartment best suited to a piano and to show graphically that the type of grand piano represented occupies but little more space than an upright piano when both instruments are placed in corners. The patterns are especially convenient for a buyer living in a small apartment, for by laying a sheet on the floor, one can tell at a glance the space a piano would occupy if purchased and brought into the home.



A Pattern Which Enables a Prospective Piano Purchaser to See How Much Room an Instrument would Occupy

TRAINING JUNGLE BEASTS FOR THE MOVIES

Often an Animal Trainer Gets More Real Excitement Out of a Celluloid Drama than Does the Open-Eyed Youngster at the Neighborhood Theater. This Man Lost an Arm

After Having His Right Arm Torn Off by a Lion, This Trainer Continues to Rehearse Wild Animals for the Movies in Arena Where Accident Occurred

Such a Scene as This must be Enacted Many Times Before a Panther Is Ready to Go through the Business Smilingly and without Prompting

Grappling with a Perfectly Healthy Lion and Explaining to Him How to Act His Part in a New Drama Is All in the Day's Work of the Trainer

In the Picture the Man Is "Dead," but Actually Is Very Much Awake, for the Docile-Looking Panther, Who has Just "Eaten" Him, Is Still New in His Rôle

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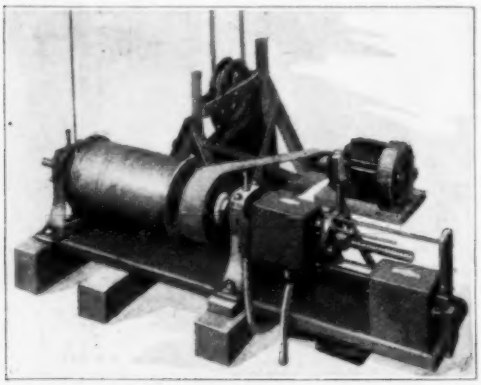
DEVICE OPERATES THEATER CURTAIN AUTOMATICALLY

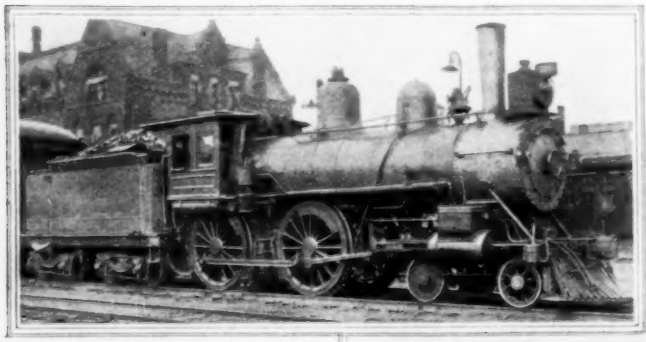
A curtain-manipulating appliance now being installed in theaters reduces the manual labor in connection with the operation of stage curtains to simply pushing a button or closing a switch. The essential parts of the device are a ¼-hp. motor, a drum on which the curtain cable is wound, and two switches. The drum is driven by a belt from the motor. The switches are inclosed in metal cases and are fastened to a framework at one end of the drum, almost in line with a threaded extension of the drum's axle. When the drum revolves, the turning of the axle causes a head to move back and forth on the extension. Projecting from the head, parallel with the axle, are two rods which travel back and forth with it and serve to operate the switches, one of which shuts off the motor while the other reverses the field of the motor. If the curtain is down the motor is started by pressing a button and runs long enough to raise the curtain the proper distance, whereupon it is shut off more accurately than ordinarily can be done by hand. In the meantime the field of the motor is reversed by the action of the other switch, and the next pressing of the button will cause the curtain to descend the proper distance.



Electrical Mechanism Which Reduces the Manual Work in Connection with Operating a Theater Curtain to Pressing a Button Once for Raising or Lowering

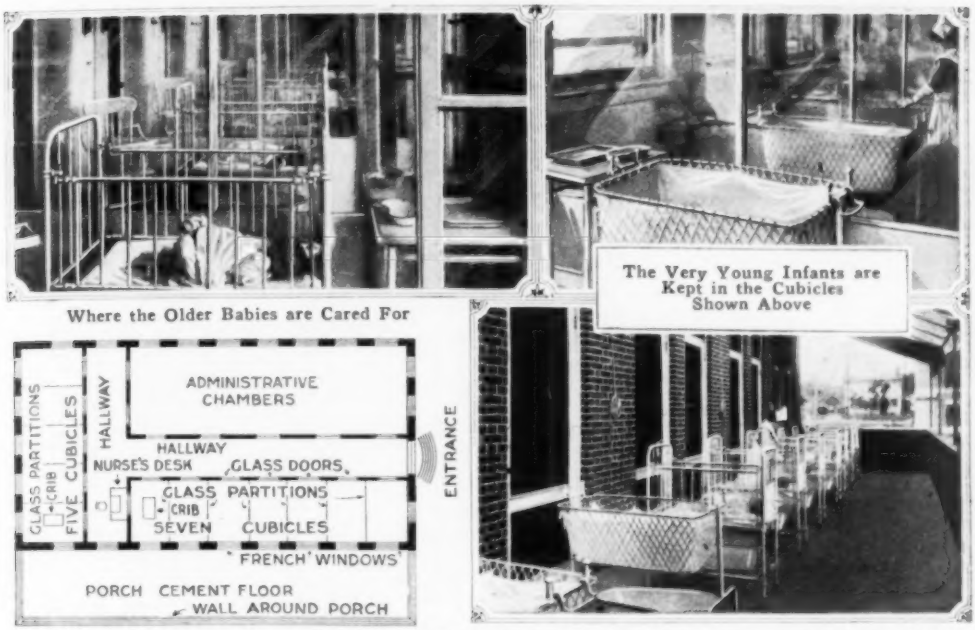
SCRAPPED ENGINES REBUILT AND RETURNED TO ROAD

Obsolete old locomotives, relegated years ago to the scrap heap, have been reconstructed by one of the western railways and put in service on some of its branch lines. Some months ago the work was first undertaken, and seven discarded engines rejuvenated. The pressing need for small locomotives at that time, and the proximity of a dull season which otherwise would necessitate the temporary discharge of a large force of shopmen, at Lincoln, Neb., were largely responsible for the inauguration of the plan. Several sidings in the yards were filled with dilapidated class-A en-



One of the Rejuvenated Engines of a Quarter Century Ago Now Pulling Passenger Trains between Nebraska City and Lincoln

Some of the Old Locomotives in the Yards at Lincoln before Reconstruction



The General Arrangement of the Building in Which the Sun-Flooded Glass Compartments are Provided is Shown by the Diagram Representing the Floor Plan. At the Right is Given a Glimpse of the Veranda with the Cribs of the Older Babies Lined in Front of the Doors

gines of a quarter century ago. These were in about the same unhappy condition in which one usually finds similar collections at yards the country over, stacks, wheels, pilots, cylinders, and other parts being missing here and there, and the general appearance anything but promising. When work was commenced upon them, the locomotives were completely dismantled and their parts sorted. From then on the work was done the same as if new engines were being constructed. Shorter boilers of greater diameter than formerly used were provided and the wheel bases lessened correspondingly, to accommodate the change. This was done in order that the boilers might have as great heating surfaces over the fire boxes as was practicable. Electric generators and other modern pieces of equipment were installed. The resulting engines are stanch and capable, and far different than when they were disintegrating in the yards. In addition to tiding the shop force over a dull season, a group of good locomotives was produced at a saving of about one-third the cost of new ones.

YOUNG BABIES SEGREGATED IN GLASS COMPARTMENTS

Twelve light-flooded, well-ventilated, glass-walled compartments for the scientific care of newly born babies are provided in a separate building recently completed at the Hebrew Infant Asylum in New York. These small chambers are arranged side by side in a right-angular row so that seven of them face the east and the remaining five, the south. Access is gained to them through separate glass doors, opening into corridors flanking the administration chambers. French doors also lead from each of the east cubicles, as they are termed, to a broad veranda extending across the front of the building. Individual toilet facilities, medical supplies, chairs, and dressing tables are placed in each of the compartments.

Glass rooms have been adopted not merely to assure abundant light and air for children during their first few months of life, but to enable them to be cared for properly and expeditiously without danger of cross infection. When there is no evidence of possible

disease, the babies' little cribs are wheeled onto the broad veranda, where they are left a few feet apart during warm, pleasant days. Should one of the infants show indications of indisposition, however, it is kept in its cubicle where it is safely removed from all the other youngsters. In this way the spread of maladies and infections is prevented. The disadvantages of the ward system are entirely eliminated and the best points of the individual room preserved without requiring that each child be attended by a special nurse. Two persons are able to look after the wants of all the babies and see at all times, without entering the compartment, whether conditions are as they should be. These precautions against the spreading of diseases might prove ineffective, in view of the fact that one nurse attends several babies, were it not that attendants sterilize their hands before leaving one cubicle for another.

MAGNIFYING MIRROR FOR MACHINISTS

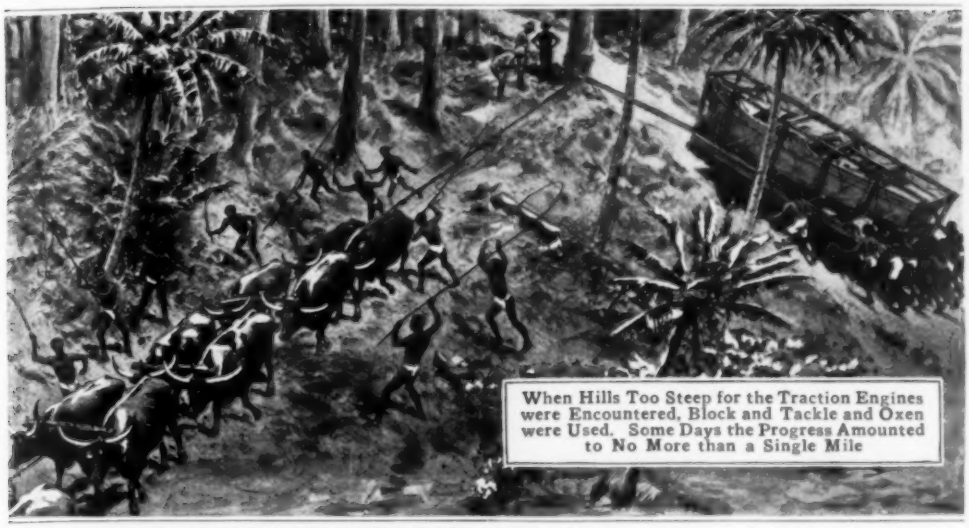
Inaccurate workmanship is made less likely by the use of a magnifying mirror made especially for toolmakers and machinists. The concave glass, which is a little over two inches in diameter, is set flush in a white-metal frame, and is supported by a straight handle of polished tubing to which it is pivotally attached, so that it can be set at any angle. The metal handle is designed to be used when the mirror is clamped in a more or less permanent position on a machine, while for other use a wooden handle may be employed. Instances in which the mirror is an especial aid are: in inspecting the cutting edges of a forming tool in a lathe or shaper; in accurately setting a height gauge; in center-punching crosslines; in setting dividers to scale lines, and in many other operations in which keen eyesight is required.

DIFFICULT OVERLAND HAUL OF BRITISH GUNBOATS

Some time ago the cables carried an account of the destruction of one German gunboat, the "Von Weissmann," and the capture of another, the "Kungani," in Lake Tanganyika, central Africa, by two small motor gunboats flying the British flag. The story of the battle in which the mosquito craft outfought the big enemy vessels forms a noteworthy picture of the usefulness these little boats have shown during the European conflict. But more uncommon is the tale of how they were launched in that far-away lake.

After being built for the Greek government, the vessels were requisitioned by the British admiralty, altered to accommodate light armament, and then, with a complement of 27 officers and men, shipped from Tilbury to Cape Town, whence they were taken by rail for a distance of 2,488 miles to Fungurumee. Ammunition and supplies were sent ahead by ox-cart and natives over a trail that had previously been blazed through the wild country by hundreds of natives. Roads had been cut through dense forests, rocks blasted away, deep gorges filled with timber to form causeways, and existing bridges and fords strengthened.

The two motor gunboats were placed in large mobile cradles, that had been made especially for the overland trek, and drawn by heavy tractors. That the rainy season might be avoided, the expedition was rushed, and the 146-mile cross-country journey to Sankosia commenced in the blistering heat of the tropical sun. The roads were soft and hilly and there were frequent breakdowns. Some days it was impossible to press ahead more than a single mile. When steep hills were encountered it was necessary to drag the boat carriages up with cables, and at other



When Hills Too Steep for the Traction Engines were Encountered, Block and Tackle and Oxen were Used. Some Days the Progress Amounted to No More than a Single Mile

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places 40 or more oxen were used. When Sankosia was reached after nearly six weeks of hard work, the boats were taken by rail to Bukama on the Lualaba River, to make the 350-mile trip to Kaballo by water. From the latter place they were shipped by rail to Lukuga, which is only a few miles from Lake Tanganyika, completing the 3,175-mile trek from Cape Town, and in all ending a journey of some 10,000 miles and four and a half months.

Because of the severe storms that visit the lake, it was necessary to construct a harbor, and this delayed the launching of the vessels until a few days before Christmas. Three days after one of the boats took to the water, the German gunboat "Kungani" was captured, and several weeks later the "Von Weissmann" was sunk.

ADJUSTABLE RACK IS HELP IN OVERHAULING MOTOR

With a newly devised stand which supports an engine, permitting it to be turned to different angles while being overhauled, a motor-car mechanic is afforded real service. The appliance is of simple, stanch construction, and forms a firm base to which a motor may be bolted after being removed from a chassis. It is adjustable and so arranged as to accommodate an engine of any ordinary size or weight. A workman has no difficulty in tilting it to any necessary position and in then making it fast while he works on either the lower or top side. Another feature is that it does not offer an obstruction to one's tools, regardless of the part upon which work is being executed. The stand is sufficiently rigid to allow an engine to be driven with a belt while mounted upon it. When three-point suspension motors are to be handled, a special, adjustable crossbar is employed.

With a Motor Securely Bolted to the Supporting Arms, It may be Turned to Any Desired Working Angle

NOVEL DISK CAMERA WORN UNDER SPY'S CLOTHING

Quite an ingenious camera, so designed that it can be concealed and

The Flat, Disk-Shaped Camera may Readily be Concealed beneath an Operator's Waistcoat with the Lens Protruding through a Buttonhole, as Shown Above

used without danger of attracting suspicion, is employed by German intelligence operators and military spies. The instrument is housed in a disk-

These Pictures Indicate the Size and Shape of Photographs Obtainable with the Instrument

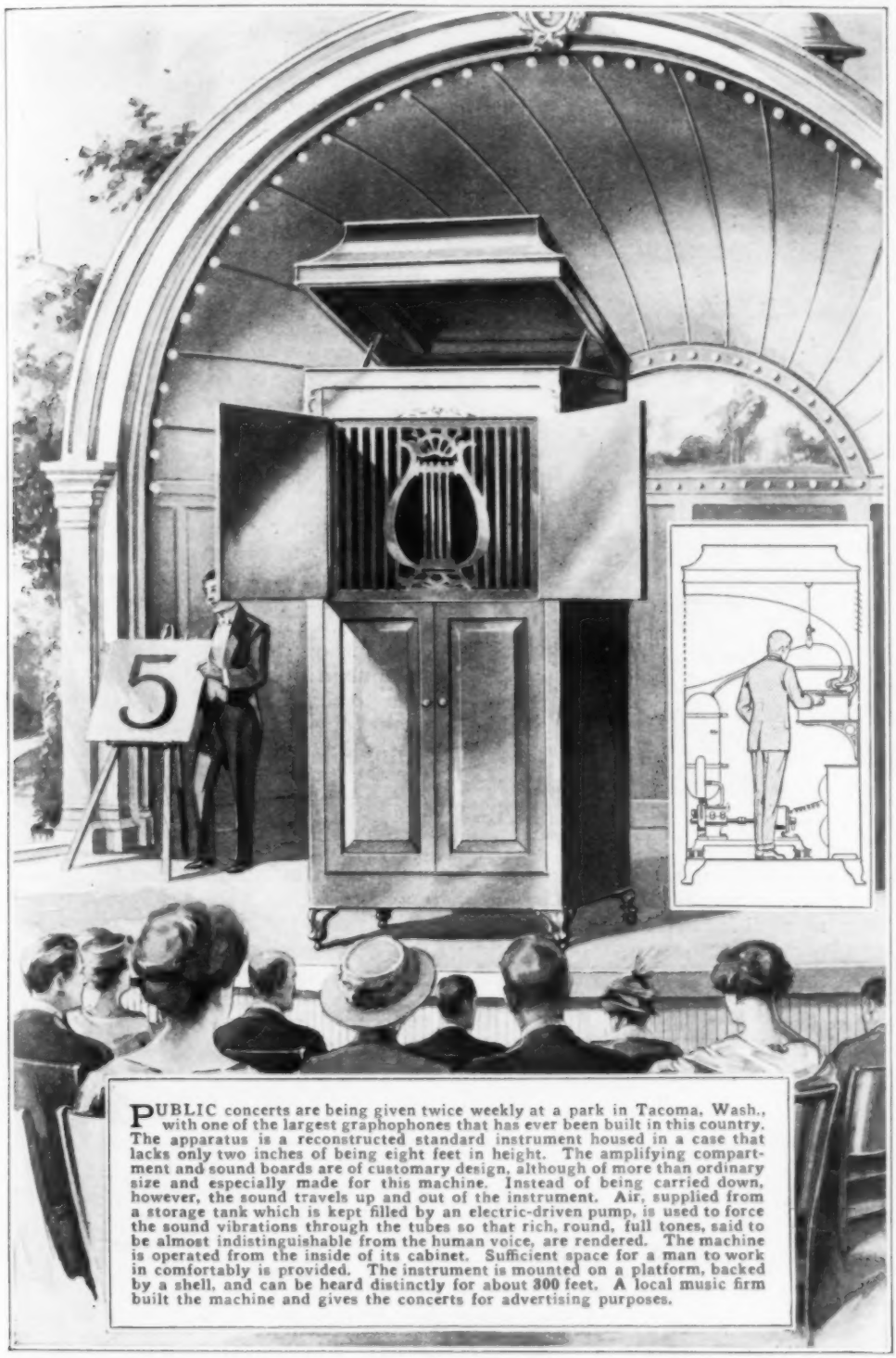
One Disk Plate Has Space for Six Exposures. The Negatives Are Sharp and Capable of Enlargement

shaped metal case, less than an inch in thickness and about six inches in diameter. It is intended to be worn over the chest beneath one's clothing, and is provided near the top with a small cone in which the universally focused lens is mounted. This part of the device resembles a button and protrudes through the wearer's vest. The shutter is operated by a string extended to a convenient pocket. A round plate is carried in the camera and each time an exposure is made this is turned 60°, for it offers sufficient space for six impressions. The pictures are circular, about one and three-fourths inches in diameter, and sharp enough for liberal enlargement.

HOW LIGHT TRANSMISSION OF LENSES IS INCREASED

Recent experiments have shown that by oxidizing the surface of glass its reflecting power may be materially lessened—a discovery of importance to the makers of such instruments as periscopes and telescopes in the operation of which as large a percentage as possible of the available light is desirable. The amount of light transmitted through each element of an optical instrument may be between 85 and 95 per cent of the total available. It can readily be seen that the light efficiency of an instrument having a number of lenses is materially lessened. For example, the efficiency of light transmitted through a modern gunsight periscope is reduced to about 32 per cent because of its thick prisms and lenses, and a user of a submarine periscope secures barely 20 per cent of the light which is available. The discovery that glass oxidized on its surface reflects less light than it otherwise would, was made by accident when a London lens expert tested a badly tarnished lens and found that it permitted considerably more light to pass than a normal lens of similar grade. The treatment which this expert developed following this discovery consists in immersing a lens, immediately after polishing, for a short time in an aqueous solution of ammonia and hydrogen sulphide

BIG PHONOGRAPH BUILT FOR OUTDOOR CONCERTS



PUBLIC concerts are being given twice weekly at a park in Tacoma, Wash., with one of the largest graphophones that has ever been built in this country. The apparatus is a reconstructed standard instrument housed in a case that lacks only two inches of being eight feet in height. The amplifying compartment and sound boards are of customary design, although of more than ordinary size and especially made for this machine. Instead of being carried down, however, the sound travels up and out of the instrument. Air, supplied from a storage tank which is kept filled by an electric-driven pump, is used to force the sound vibrations through the tubes so that rich, round, full tones, said to be almost indistinguishable from the human voice, are rendered. The machine is operated from the inside of its cabinet. Sufficient space for a man to work in comfortably is provided. The instrument is mounted on a platform, backed by a shell, and can be heard distinctly for about 300 feet. A local music firm built the machine and gives the concerts for advertising purposes.

RANGER REACHES TREE TOP WITH SPIRAL LADDER

On the summit of Brush Mountain in the Crater National Forest of southern Oregon, the top of a tall fir tree is

This Tall Fir is Used as a Lookout Station by a Lone Forest Ranger, Who Built the Spiral Ladder Unassisted

used as a lookout station by a ranger who patrols the woods and is on a constant vigil for fires. In establishing his observatory, the man constructed a spiral ladder which winds about the trunk and extends to the uppermost part of the great tree. He did the work unassisted, and in a stanch and durable manner. The rungs of the ladder consist of heavy yew pegs driven into 2-in. auger holes, spaced at regular intervals and bored 1 ft. deep into the tree. After these members had been put in place, their outer ends were connected and reinforced by a heavy railing, made of partly sawed Douglas-fir poles. The ladder extends about 80 feet above the ground, and from the top of it one can see for miles in all directions.

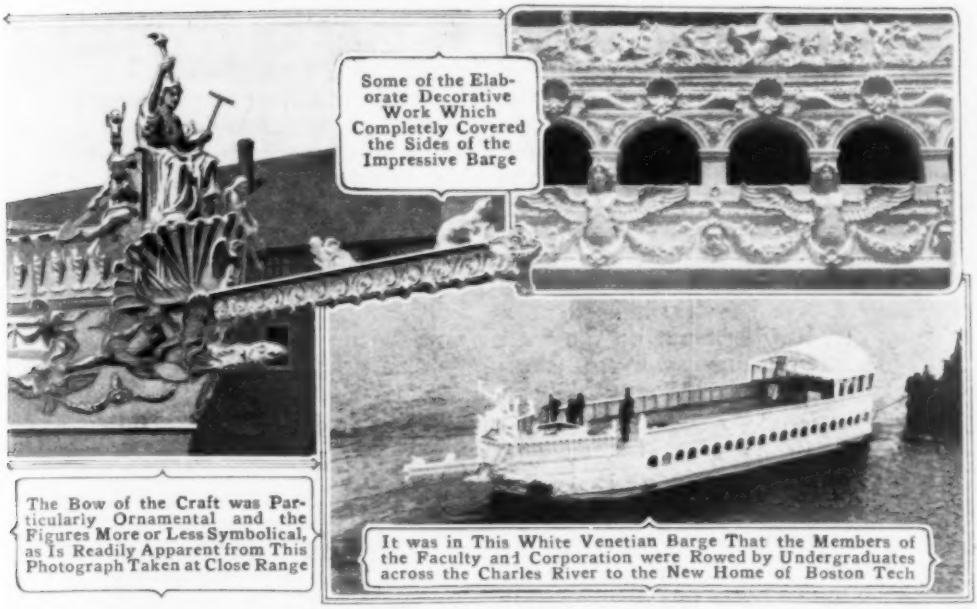
NEW HOME OF BOSTON TECH IMPRESSIVELY DEDICATED

In celebrating the semicentennial of its founding, the Massachusetts Institute of Technology was formally moved from the heart of Boston across the Charles River to its new waterfront home in Cambridge. The structures, which are grouped about a great court and covered by a single roof, occupy approximately a third of a beautiful 50-acre site. Their architecture is dignified and impressive, while their arrangement is admirably suited for the needs of the institution.

The anniversary and dedication exercises, lasting three days, brought together hundreds of alumni and students, while many thousand guests were included in those who witnessed a spectacular masque and pageant performed in observance of the occasion. The latter was undoubtedly unique in the history of American universities. The members of the faculty and corporation assembled at the old campus in Boston and filed in a procession to the Charles River, carrying in ornate chests the great seal and charter of the institution. At the water front they entered a Venetian barge, the "Bucentaur,"—a replica of a historical state vessel—and were rowed by 40 undergraduates to a landing before the new group of buildings on the opposite shore.

Following this was enacted the masque in which more than 500 performers participated. Tiers of seats had been constructed in the central court to accommodate some 7,000 spectators. The play depicted the development of civilization. On the parapet of one of the buildings were 34 projectors, certain of which were fitted with red, some with green, and others with blue screens. They were used effectively during the masque for flood and spot lighting.

A striking demonstration marked the banquet held the last evening of the celebration. Boston Tech alumni in 34 cities listened to the toasts simultaneously via long-distance telephone.



Some of the Elaborate Decorative Work Which Completely Covered the Sides of the Impressive Barge

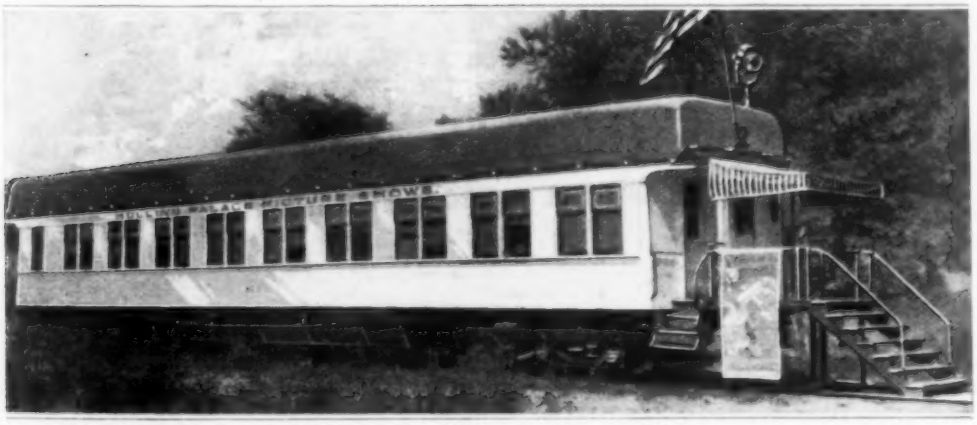
The Bow of the Craft was Particularly Ornamental and the Figures More or Less Symbolical, as Is Readily Apparent from This Photograph Taken at Close Range

It was in This White Venetian Barge That the Members of the Faculty and Corporation were Rowed by Undergraduates across the Charles River to the New Home of Boston Tech

The significance of the event may be appreciated by the fact that the wires extended to the four corners of the country, reaching Akron, Atlanta, Boston, Birmingham, Buffalo, Butte, Chicago, Cincinnati, Cleveland, Dayton, Detroit, Duluth, Harrisburg, Indianapolis, Kansas City, Los Angeles, Louisville, Milwaukee, Minneapolis, New York, New Orleans, Philadelphia, Pittsburgh, Portland, Rochester, St. Louis, Salt Lake City, San Francisco, Seattle, Schenectady, Spokane, Syracuse, Urbana, and Washington.

MOVIE THEATER ON WHEELS PLAYS SMALL TOWNS

For touring a number of the midwestern states, an Illinois showman has converted a Pullman car into a thoroughly equipped, well-appointed moving-picture theater. The interior has been remodeled and refinished throughout, opera chairs installed, and intake and exhaust fans provided at opposite ends of the car, the outside of which is painted white. A temporary landing and broad stairs with substan-



With Seating Capacity for 130 Persons, This Railway Movie Theater Visits Small Towns in the Middle West

tial railings are joined to the rear platform when the car is sidetracked and the theater opened for small-town patronage. Electric current for the projector, theater lights, a searchlight mounted on the roof, and rows of colored lamps ornamenting the outside of the car, is supplied by a special generating unit. The equipment represents an investment of about $8,000. So far as is known, this is the first time that a traveling movie theater, housed in a railway car, has been put on the road purely as an amusement venture. Similar plans have been tried repeatedly in the past, however, for propaganda purposes.

TO FILM WORLD'S-SERIES GAMES IN NOVEL WAY

When the world's-series baseball games are staged this fall each contest will be shown on moving-picture screens in some of the large cities a few hours after being played. Two producing companies have coöperated in purchasing a number of mechanical baseball boards, on which small manikins are made to go through the various movements of a game. These will be installed at different plants and as the championship battles are fought, the details of each play will be telegraphed to the studios where the games will be reënacted by manikins before cameras. The same evening the finished pictures will be displayed. The board consists of a grooved platform marked off like a baseball field. There is a full quota of properly uniformed players, even base coaches and an umpire being included, which go through nearly all the motions of flesh-and-blood stars. In the palm of the right hand of each manikin there is a small, white-rubber patch. When a specific man has the ball, this patch is inflated. As the sphere is thrown, the arm of the mimic player swings in a natural way, the "ball" collapses, and the patch in the upraised hand of the one who catches it, swells out. The inflation and deflation is accomplished by means of bulbs connected by tubing to each of the manikins and kept from sight beneath the platform within reach of the operator stationed there. The umpire calls balls and strikes by raising his arm, the batter swings at a ball or allows it to pass, as the case may be, drops his bat and runs the bases, or retires to the bench. When a batter strikes a ball, a solid-rubber one is rolled to an infielder, who stoops for it as it disappears through a hole in the platform; or it is carried through the air by an invisible wire to an outhelder, according to whatever actually happened in the original game. Errors, wild throws, passed balls, and balks are explained by cards inserted in an announcement slot on the fence back of the field.

By Means of Manikin Baseball Boards of This Kind the World's-Series Games will be Reenacted before Movie Cameras and Shown on the Screens in Different Large Cities during the Evenings After They are Played

A Machine-Gun Unit Capable of Fast Maneuvering: Shield can be Folded Up if Desired, and the Gun and Tripod can be Removed from Carriage

GUN CARRIAGE AS TRAILER OR MOTORCYCLE SIDECAR

A new machine-gun unit adapted to rapid maneuvering consists of a motorcycle and a two-wheeled carriage on which are mounted a machine gun, ammunition lockers, and a protective shield. There is room also to carry the gunner. The frame of the motorcycle is so constructed that the carriage can be attached to either side as a sidecar or to the rear as a trailer. When the former arrangement is employed one carriage wheel is removed and taken along as a spare. For ordinary usage on the road the shield, which has wings to furnish protection at the sides as well as at the front, is folded up, though in an emergency it can be used while moving. When desired the machine gun with its tripod can be removed from the carriage.

STEAMER ON ROCKS NEAR HONGKONG ABANDONED

The "Chiyo Maru," a vessel of 22,000 tons' displacement which went ashore on Lema Island 30 miles from Hongkong several weeks ago, has been abandoned together with her valuable cargo, according to reports reaching this country. The underwriters have accepted the loss. The accident occurred at 4:30 in the morning in a dense fog. With its bow on the rocks and the sea subjecting the hull to great strain, the vessel was broken in two. Fortunately all the passengers and crew were removed to safety. Not long

View of Liner "Chiyo Maru" being Battered by the Waves on the Rocky Shore of Lema Island, About 30 Miles from Hongkong

after the accident the stern sank to a point where even its upper deck was washed by the waves. The vessel was en route from Manila to Hongkong.

PORTABLE TALKING MACHINE OPERATED BY BLIND MAN

In one of the large cities a blind man makes use of a portable phonograph, instead of the more customary fiddle or

Stationed at a Street Corner, a Blind Man Operates This Phonograph and Collects Offerings

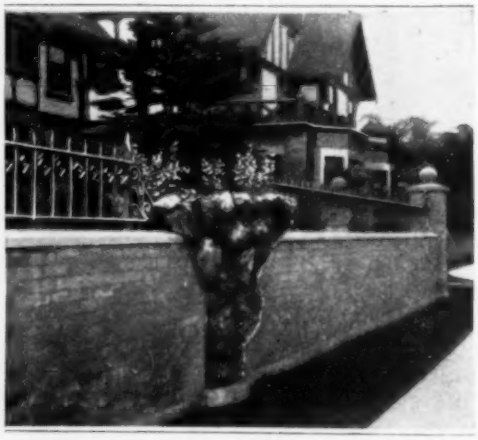
accordion, for attracting passers-by, and soliciting alms. The machine is housed in a wheeled cabinet, about the size of a small pushcart such as is used in certain districts by ice-cream venders. Supported at the top of the contrivance is a large horn of the ordinary type, in front of which is a receptacle in which coins may be deposited by those who are charitably inclined. The lower part of the case is arranged to accommodate a number of records.

AEROPLANES TO AID SOUTH AMERICAN EXPLORERS

Aeroplanes are to be included in the equipment of an exploring expedition that is setting out from Buenos Aires to study a little-known region which includes Mar Chiquita, a lake having an area of some 1,000 square miles, located about 350 miles northwest of Buenos Aires. It is the belief of the explorers that with aeroplanes it will be possible to secure panoramic photographs which will prove invaluable in showing the topography and geography of the country. One of the purposes of the party is to gather data which will lead to building canals in this region, so that the lake and surrounding rich lands may be placed in direct communication by water with Buenos Aires and the ocean. The party is privately financed, but is undertaking this work in celebration of the 100th anniversary of Argentine's independence.

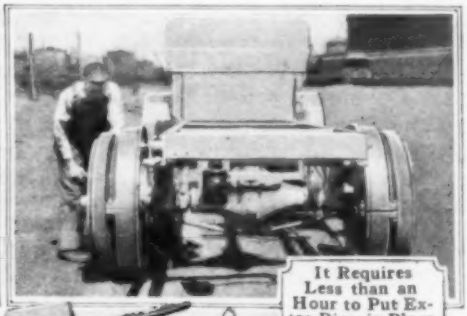
UNUSUAL FLOWER HOLDERS IN CALIFORNIA FENCE

Flower containers, which are unusual in appearance and striking because of the contrast which they present to their surroundings, have been built into the center of each of three sections of a smooth brick wall in front of a Los Angeles residence. The wall is surmounted by an ornamental iron fence except at the points where the flower holders stand. Each container consists of rough, irregular masses resembling slag, which are cemented together into a symmetrical shape; each holder stands about three and one-half feet high, is a foot or a little more in diameter at the base, and three feet wide at the top.

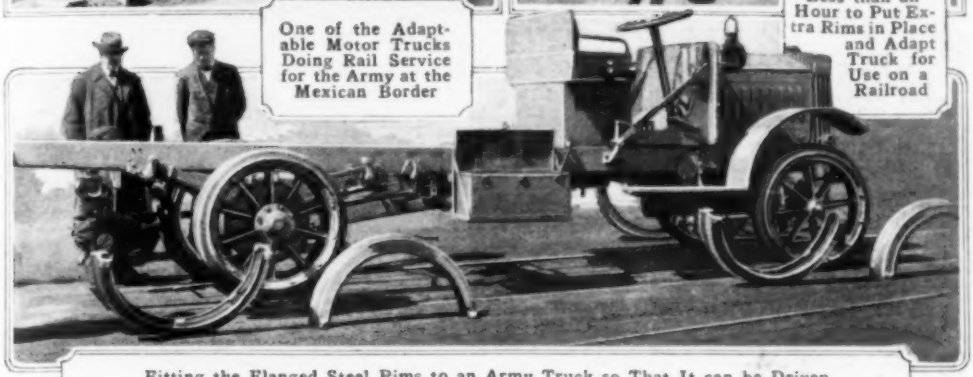


Flower Containers of Unusual Design Which Present a Striking Contrast to the Smooth Brick Wall into Which They are Built

One of the Adaptable Motor Trucks Doing Rail Service for the Army at the Mexican Border



It Requires Less than an Hour to Put Extra Rims in Place and Adapt Truck for Use on a Railroad



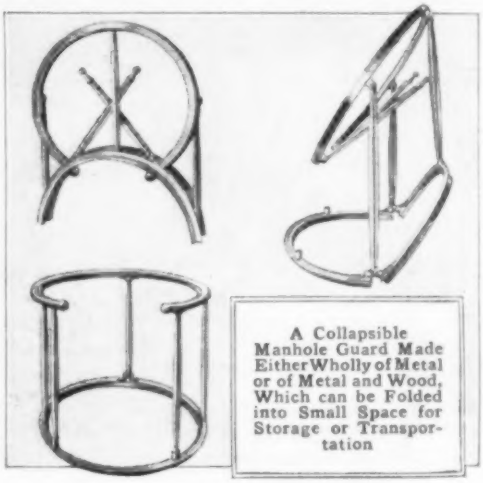
Fitting the Flanged Steel Rims to an Army Truck so That It can be Driven on a Railway Track

FLANGED RIMS FIT TRUCKS FOR SERVICE ON RAILS

Recently invented flanged rims, which are designed to be fitted to the wheels of a motor truck of a well-known make, now render these trucks so adaptable to service on either a highway or a railroad that the United States government has purchased 30 of the three-ton trucks, fitted with these extra rims, for service on the Mexican border. The attachment consists of two similar castings for each wheel which can be bolted tightly over the rubber tires. Four wheels can be fitted with them in less than an hour. In a recent test one of these cars went by rail from El Paso, Tex., to Columbus, N. M., a distance of 93 miles, carrying 20 soldiers and a machine gun, and traveled at an average rate of over 18 miles per hour. On arriving at Columbus the rims were quickly removed and put in the car, and the vehicle driven up the main street of the town.

MANHOLE GUARD IS COLLAPSIBLE

A manhole guard is now being used in connection with substreet work in cities which possesses the special advantage of being easily portable because it is collapsible. It is made either entirely of metal, or of metal



A Collapsible Manhole Guard Made Either Wholly of Metal or of Metal and Wood, Which can be Folded into Small Space for Storage or Transportation

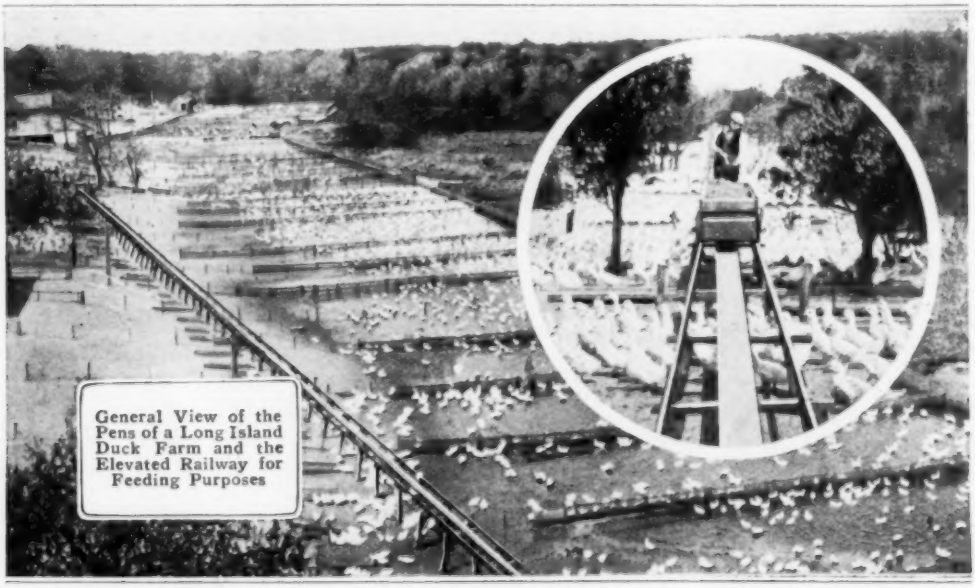
and wood. A round, or square, base is divided into halves which are hinged together, and hinged to this base are three uprights which are also hinged to the guard rail, which is the same shape as the base except that a sector is lacking to permit easy access to the manhole by workmen. Two other supports are hinged to the upper rim, and when the guard is fully open they fasten to the base. To fold up the device it is only necessary to detach the lower ends of these two uprights and double up the base, which operation automatically folds up all the parts so that they lie in one plane.

MODERN METHODS USED ON BIG DUCK FARM

A striking example of the manner in which fowls may be raised on a large scale with success is found in a Long Island duck farm where no less than 120,000 ducks are raised for the market each year—a record which makes this establishment one of the largest duck farms in the world, if not the largest. The tract on which the fowls are raised is traversed by a creek which is divided transversely into numerous pens, each of which communicates with a sloping bank of sand where food troughs are placed. Food is carried to these pens in cars which run on a narrow elevated railway erected parallel with the creek. About 2,200 ducks are kept in the breeding pens; from these as high as 1,800 eggs are gathered daily. These eggs are incubated, from 4,000 to 7,000 being hatched each week. Most of the ducks are kept until about 11 weeks old, and then killed, picked, and dressed for the market.

PORTLAND'S ROSE FESTIVAL IS CARNIVAL OF COLOR

Of the many pleasing features of this season's spectacular rose festival at Portland, Ore., a gorgeous illuminated fountain of roses and greenery held the center of the carnival stage. It was a shapely big cone of rose bushes, reaching fully 50 ft. in height and occupying the place of honor in an expansive beautiful garden where color was in riot. Hidden behind hundreds of blooms and banks of glossy leaves was a myriad of small electric lamps. At night these were controlled so as to produce the effect of an unceasing shower of blossoms. The same idea



General View of the Pens of a Long Island Duck Farm and the Elevated Railway for Feeding Purposes

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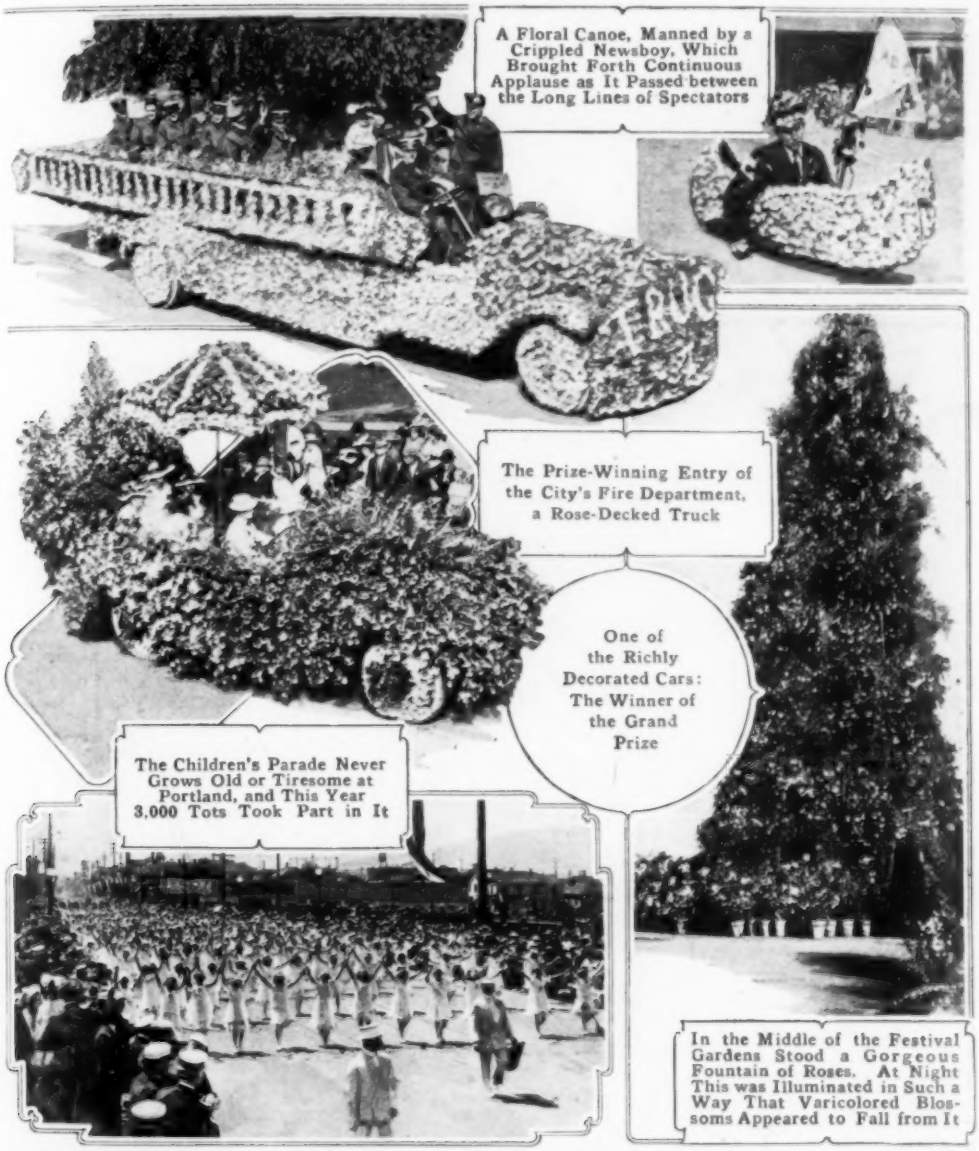


A Floral Canoe, Manned by a Crippled Newsboy, Which Brought Forth Continuous Applause as It Passed between the Long Lines of Spectators

The Prize-Winning Entry of the City's Fire Department, a Rose-Decked Truck

One of the Richly Decorated Cars: The Winner of the Grand Prize

The Children's Parade Never Grows Old or Tiresome at Portland, and This Year 3,000 Tots Took Part in It

In the Middle of the Festival Gardens Stood a Gorgeous Fountain of Roses. At Night This was Illuminated in Such a Way That Varicolored Blossoms Appeared to Fall from It

was carried out at a Paris exposition some years ago, but it is not believed to have been employed before in this country. The three-day fête was marked with the usual flower parades, which this year were especially attractive. Several score of motor cars, each covered with flowers, participated in the vehicular procession, which was rendered somewhat out of the ordinary by its total absence of floats. The children's parade, an event which has been held annually for the past 10 years, had some 3,000 youngsters, many of them costumed with roses, enrolled in it. The streets were lined with spectators when the little tots passed.

¶This country, instead of Germany, now leads the world in its number of electric steel furnaces; it has 73 as compared with Germany's 53. The capacity of these 73 is less than five per cent of our steel output.

NEW DESIGNS IN LAMPS FOR THE HOME,

The Base of This Lamp Is an Old Italian Castle
Hammered-Brass Lamp with Bowl for Fruit and Nuts
Metal Floor Lamp with Pot and Vine Standard
Crystal Candlestick with Colored Decoration and Taper
Dresden-Finish Wall Sconce with French Shade
Black and White Painted Candlestick
Right: Statue Lamp. The Soap Bubble Is the Light
Right: Floor Lamp with Places for a Pipe, a Glass, and a Book
Twin Lamps with a Single Shade: The Standard Is of Hand-Wrought Antique Silver; the Base of Ebony, and the Shade of Italian Brocade
Below: Chinese-Woman Hall Lamp
Silver Compote with Candle in Center
Either Direct or Indirect Lighting may be Obtained with This Lamp
Special Heating Shade for Use on Kerosene Lamps

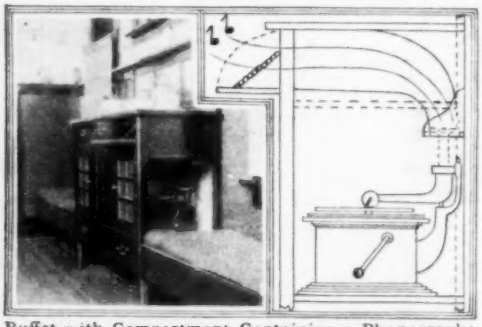
338

PRACTICAL, CONVENIENT, OR DECORATIVE

Wall Lamp: One Side Is Round, the Other Flat
Desk Lamp with Ink Stands, Pen Tray, and Stamp Box in Base
Lamp with Wicker Standard and Shade
Veranda Candle of Red Enamel and Decorated Glass
Owl Night Lamp of Brown Porcelain
Left: Hall Lamp. The Ball Is the Bulb
Classic Lamp with an Electric Light Replacing the Wick
Silver Candlestick with Cut-Glass Flower Holders
Metal Lamp, 34 Inches High. The Oriental Figure Carries the Light on His Head
Black Bungalow Lantern of Painted Tin
Left: Lamp inside Venetian-Glass Bowl with Colored Fruit Cover
The Base of This Lamp Holds 500 Index Cards
Left: Folding Lamp for a Traveler

PHONOGRAPH BUILT INTO END OF BUFFET

A phonograph has been built into the end of a buffet by a man in Victoria, B. C., in such a way that the

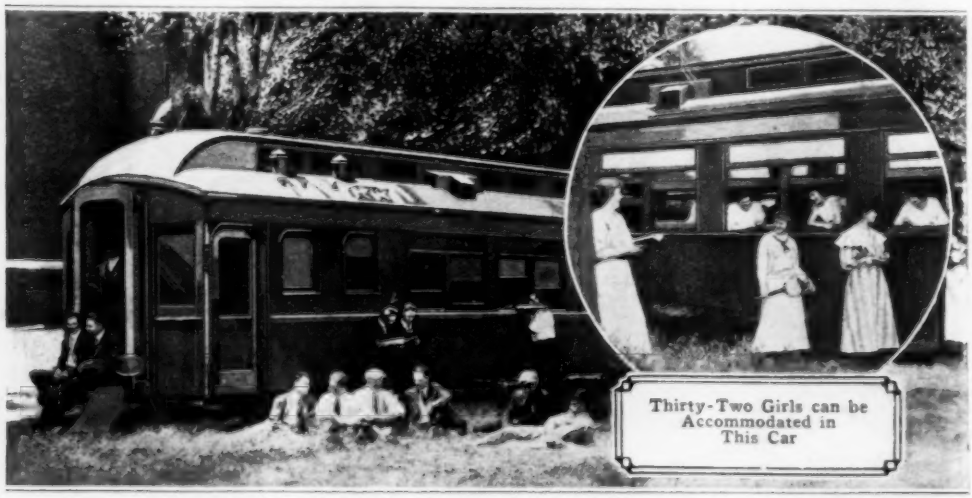


Buffet with Compartment Containing a Phonograph: Diagram Shows How Drawer Space Serves as a Horn

space which would naturally be occupied by one of the drawers is inclosed to serve as a horn. The machine used was one of excellent tone, of the detachable-horn type. The old horn was discarded and the machine mounted in a compartment just beneath, and suitably connected with, the inclosed drawer space. A panel at the end of the buffet was constructed so that it could slide up and down. Thus, to change a record, it is only necessary to lower the panel. A false drawer front, hinged at its lower edge, was fastened at the front end of the horn, and when closed, serves to give the buffet the appearance of an ordinary sideboard; opened, it reveals the mouth of the horn across which extends a grille.

SLEEPING CARS MADE INTO COLLEGE DORMITORIES

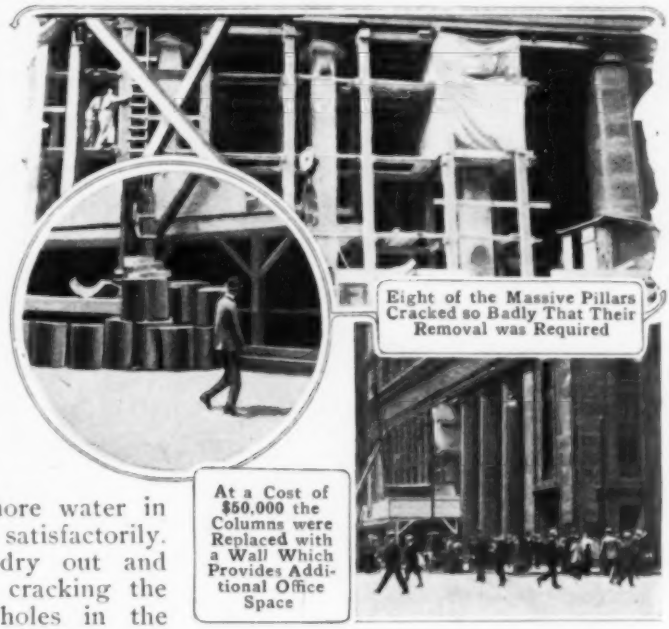
Two Pullman sleeping cars constitute the novel addition to the dormitory equipment of Blackburn College, Carlinville, Ill., which was acquired during the past year because of the rapid increase in attendance at the institution. The cars, while no longer suited for extended journeys, are in excellent condition and are very popular with the students. They were switched to a sidetrack near the campus, and then lifted from their trucks and transferred to brick foundations close to the college buildings. Permanent steps were built at the ends of the cars. The sleeper occupied by the men has 12 upper and 12 lower double berths. There are accommodations for 32 in the girls' car, which includes an observation room at the end that has been fitted up as a living room. The cars are connected with a hot-water heating system which makes them very comfortable in winter.



Pullman Car Serving as a College Dormitory: In Winter This Car and One for Girls is Heated by a Hot-Water System with Which Both are Permanently Connected

FROST CRACKS WRONGLY BUILT BANK PILLARS

A costly error made in erecting the eight massive granite pillars at the entrance of the new Continental and Commercial National Bank building in Chicago, resulted in their being so cracked by frost that it has been necessary to tear them out. The pillars were 39 ft. high, composed of hollow granite drums placed about steel columns. Because of a delay in building operations, the original plan of filling the drums slowly and one at a time with rather dry concrete was abandoned, and each pillar was filled from the top with concrete having more water in it so that it would pack satisfactorily. This filling failed to dry out and froze in cold weather, cracking the drums. The circular holes in the drums were eccentric, so that each drum had a thin side which was made even thinner by chipping away some of the stone on the inside to permit the proper placing of the pillars in spite of the lack of alinement of the steel columns. It was along these thin sides that the cracks appeared. The owners of the building replaced the pillars with a wall which allows more office room than formerly.

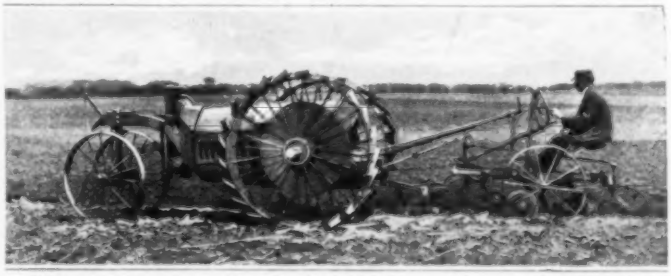


Eight of the Massive Pillars Cracked so Badly That Their Removal was Required

At a Cost of $50,000 the Columns were Replaced with a Wall Which Provides Additional Office Space

TREAD OF TRACTOR'S DRIVE-WHEELS ADJUSTABLE

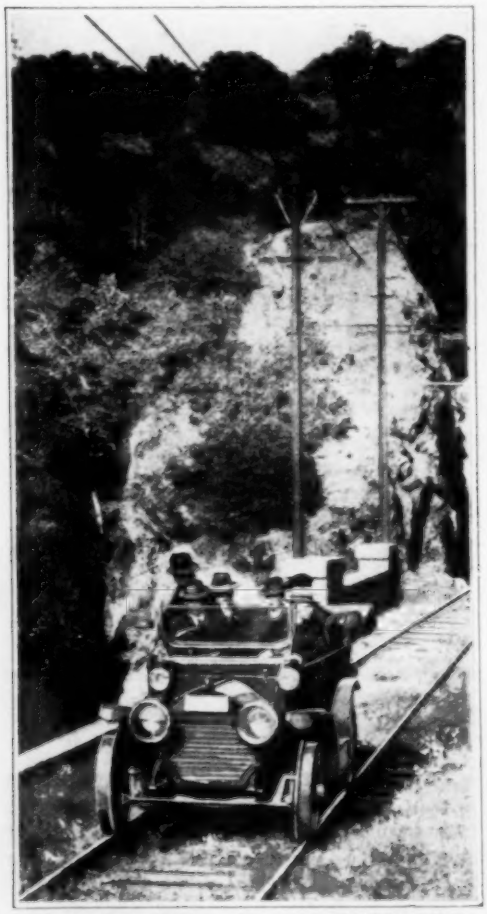
With the aim of developing a gasoline tractor capable of completely replacing the horse for field work on a farm, an Illinois inventor has constructed a machine which has a number of apparently good points. It will plow, harrow, plant, cultivate, run a binder, or operate almost any other ordinary agricultural implement. The driving wheels are so arranged that the tread may be varied for different crops according to the distance between furrows. The engine is equipped with a governor which keeps the tractor at a reasonably constant speed by automatically actuating the throttle and spark. A plow, or cultivator, is coupled to the machine and ridden by the operator.



The Tractor Travels at a Predetermined Speed, Since the Engine is Automatically Controlled by a Governor

NOVEL SCHEME OF FIGHTING JITNEY-BUS COMPETITION

Experiments conducted at San Jose, Calif., during the summer indicate that traction companies, in districts in-

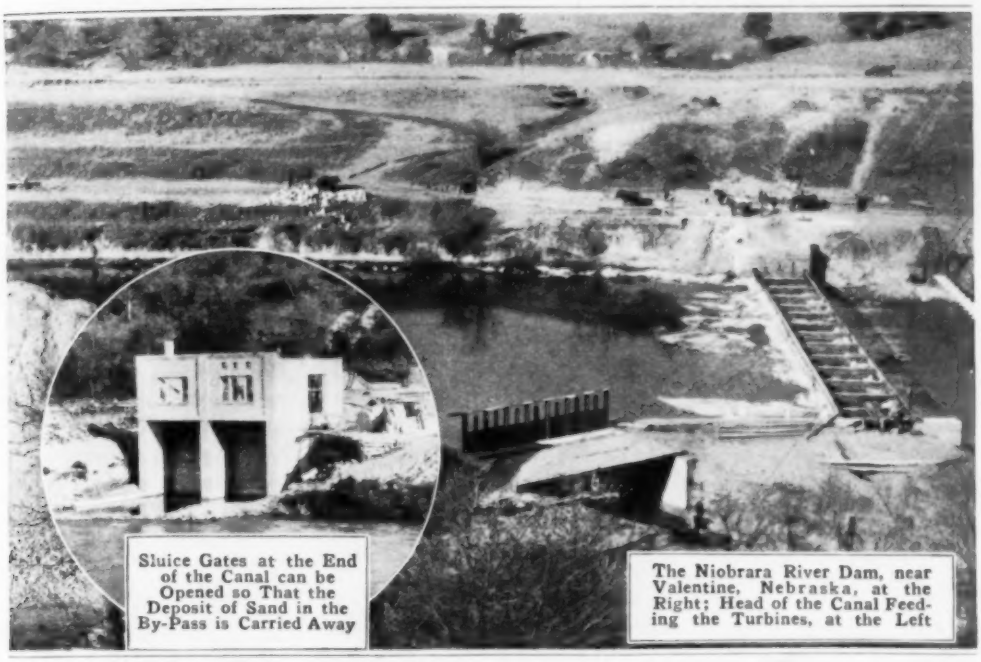


From the Tests Conducted with This 1908-Model Car, It is Estimated That 85 Miles could be Made on One Gallon of Fuel with Similar Machines

fested with jitney busses, have a possible means of effectively competing with the low-fare motor cars which for about two years have demoralized local transportation businesses on the Pacific coast. The plan consists in fitting touring cars with flanged wheels and operating them over existing tracks, instead of using the heavier and more expensive rolling stock. An old machine thus equipped was tried out with very favorable results. Over average roads it is capable of making about 10 miles on 1 gal. of gasoline. When placed on rails, however, it traveled uphill and down grade carrying eight persons for a distance of 16 miles on 1½ pt. of fuel. This indicates that approximately 85 miles could be gotten out of a single gallon of gasoline. Compared with the expense of running a standard electric car the same distance, this represents a great saving in operating cost. Furthermore eight or ten used motor cars could be purchased for the price of one interurban car, and one man instead of two would be needed in operating the former unit, while a faster schedule could also be maintained with them. In this way a handful of passengers could be transported at a profit instead of a deficit.

POWER PROJECT DEVELOPED ON NEBRASKA RIVER

Nebraska's largest hydroelectric power plant has recently been completed on the Niobrara River, a few miles east of Valentine in the northwestern part of the state. Owing to the fact that the site is in a ranch country where help is difficult to get, unskilled Indian and transient labor was used almost exclusively. Although the station is so far the biggest in the commonwealth, it is not large as hydroelectric plants go, and is capable of developing only about 3,000 hp. This will be adequate, however, to meet the needs of a considerable section of the surrounding country. It was impossible to obtain much of a fall, and therefore the engineers in charge of the project were forced to rely on a large volume of water rather than a small flow at high pressure. It is estimated that the Niobrara carries approximately 1,260 tons of sand past a given point in an hour, and this condition presented somewhat of a problem, for unless efficient measures were devised for preventing it, the canal carrying the flow from the river to the turbines would rapidly become filled. The idea of employing dredges was abandoned in favor of another plan, which is apparently going



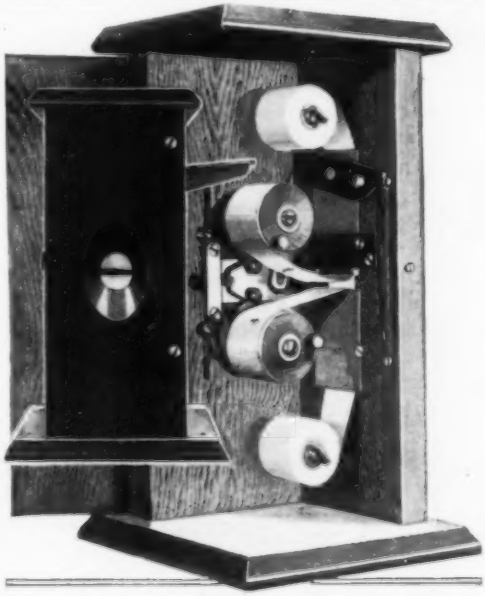
Sluice Gates at the End of the Canal can be Opened so That the Deposit of Sand in the By-Pass is Carried Away

The Niobrara River Dam, near Valentine, Nebraska, at the Right; Head of the Canal Feeding the Turbines, at the Left

to prove satisfactory. The slip is only a couple of blocks in length and at the far end large sluice gates have been established. When these are opened almost the entire river is diverted through the pass, thoroughly flushing it and carrying away the deposit of sand on the bottom.

SANITARY PROTECTION FOR CIGAR-CUTTER BLADES

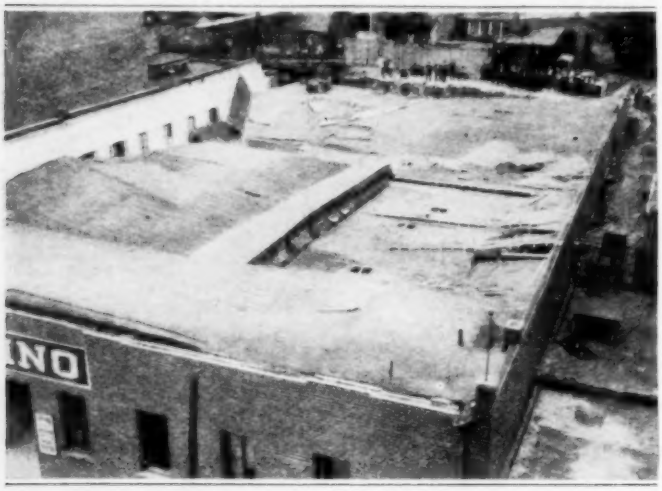
A cigar cutter has been designed by a resident of Portland, Ore., that is more sanitary than the ordinary cutter. Just back of and at the lower edge of the opening into which the cigar is inserted to be clipped is a stationary blade; above it is a blade controlled by a spring-held lever. Neither knife comes in actual contact with the cigar, because two ribbons of paper are so threaded through apertures that one passes over the edge of the lower blade and the other over the edge of the upper one when it is pressed down. The knives do not quite come together, so they do not cut the paper; each operation of the cutter causes rollers to turn, and this draws clean portions of the ribbon across the steel edges. When the rolls of paper have been used up new ones can be substituted. The device is intended especially for installation in tobacco stores.



A Cigar Cutter the Blades of Which are Protected by Clean Ribbons of Paper

ROOF OF LARGE ATLANTA SKATING RINK FALLS

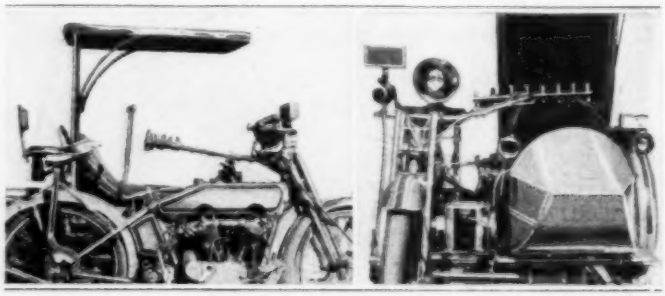
Faulty construction caused the roof of a large skating rink in Atlanta, Ga., to cave in recently, killing three and injuring 10 persons. The rink was a one-story structure with brick walls and a wooden roof, along the center of which extended a ventilator. The theory has been advanced that in an attempt to make a skating area in which there were the fewest possible obstructions the number of supports used was wholly inadequate. The walls were not seriously injured by the crash. Rescue parties which hurried to the scene found difficulty in getting at the imprisoned persons and finally cut holes in the roof to facilitate their recovery. The accident occurred in the evening while exhibition skating was being featured.



A View of the Collapsed Roof of a Skating Rink at Atlanta, Georgia, Showing the Holes Cut in the Fallen Portion through Which Rescues were Attempted

MOTORCYCLE EQUIPPED FOR CRIPPLED DRIVER

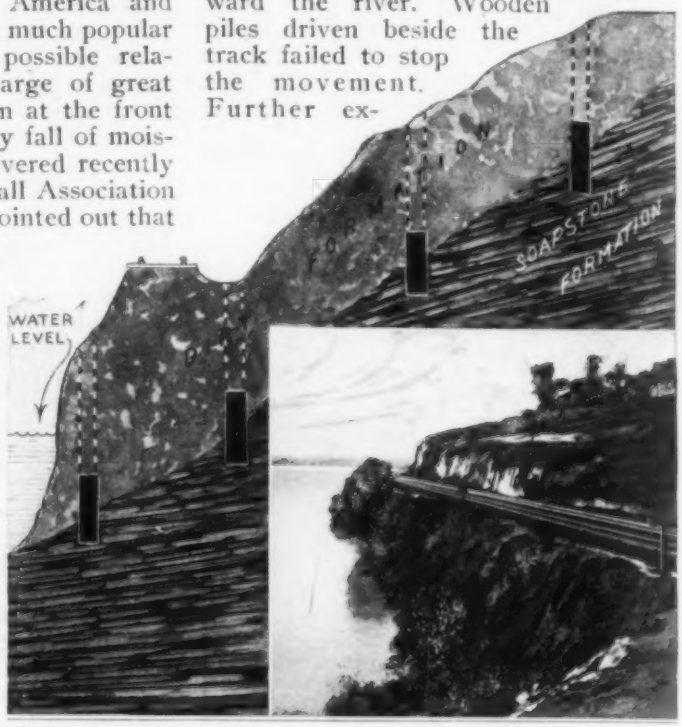
A motorcycle, together with its sidecar, has been equipped with controlling devices of peculiar design for a rancher in the Southwest, who is so crippled that the principal movements of his hands are obtained by swaying his body; he has the partial use of one leg also. The owner drives his machine from the sidecar, which has a top and certain levers so situated that he can operate them with his foot. Mounted between the sidecar and the motorcycle is an electric starter which has been rewound so that the machine can be backed up as well as started. The gear-shift lever has been moved down by the side of the driver. In place of the handlebars is a sort of tiller, at the outer end of which is a cross arm having a series of knobs which the driver can grasp easily. By moving his arms and body from side to side and supplementing this effort with a certain amount of foot control, the disabled man drives about very satisfactorily. At the rear of his machine is a signal, by means of which he can indicate to those who may be behind him, which way he is to turn or when he is going to stop. About $1,000 is said to have been the cost of the outfit.



A Motorcycle Equipped with Special Means of Control so That It can be Driven by Its Owner, Who Is a Cripple

EXCESSIVE RAINFALL AND THE WAR

The fact that the latter part of the year 1914 and much of 1915 and 1916 have been marked by excessive rainfall in many parts of America and Europe has given rise to much popular speculation as to the possible relation between the discharge of great quantities of ammunition at the front in Europe and this heavy fall of moisture. In an address delivered recently before the British Rainfall Association a member of that body pointed out that the processes of nature are so vast that it is highly improbable that even the great gunfire of recent months has had any effect on precipitation. To illustrate this statement it was shown that in one month the excess of rainfall over an area of 58,000 square miles, which includes England and Wales, was 3½ in. The speaker showed that this large excess represents over 13 billion tons of water and that the minimum quantity of air which must have been carried over England and Wales to transport that water in the form of vapor must have been at least 100 times that amount in weight. Such staggering figures are regarded as evidence that the amount of force required to move masses of this magnitude is far beyond that which can be exerted even by modern nations at war.



To Prevent the Earth Embankment above and under This Railroad from Slipping into River, Rows of Holes were Drilled through the Soil into the Slanting Soapstone Stratum and Filled with Concrete, as Shown in Cross Section

CONCRETE MASSES ANCHOR SLIDING SOIL TO ROCK

An ingenious yet simple method of stopping a slide was recently employed on a stretch of railroad track at a point on the shore of the Missouri River between Omaha and Kansas City. At the location in question the track lies between the river bank on one side and a bluff on the other. During the heavy rains of the summer of 1915 it was found that the roadbed, which up to that time had remained in perfect alinement, was gradually slipping toward the river. Wooden piles driven beside the track failed to stop the movement. Further examination showed that the slipping began up on the hillside, about 600 feet from the rails and on private property. The property owners forbade the engineers to drive piles in their land but consented to the sinking of several holes. These showed that there was a stratum of earth resting on a stratum of soapstone which slanted toward the stream. Because of the excessive rainfall the stone had become moist and slick and had allowed the land gradually to slip toward the river. For the purpose of anchoring the earth to the stone many holes were sunk through the soil and into the stone to a depth of about six feet. These were partly filled with concrete and then with dirt, the concrete masses serving as anchors.

RADIO LICENSE IS ISSUED TO WESTERN SCHOOLGIRL

After distinguishing herself locally by constructing her own wireless equipment, a 15-year-old California schoolgirl, at San Rafael, has lately climbed into the limelight by passing the Federal radio examination and winning a first-class commercial license. According to her own story, she became interested in wireless work at the age of nine, when she was called upon by an older brother to assist in the building of some instruments. Subsequently she learned both the continental and Morse codes by means of buzzers placed in different rooms at her home. For a long time brother and sister spent an hour every evening at their respective desks, sending and receiving signals. Under the direction of her brother, the girl built a ¼-kw. outfit, which she now uses. It is a very creditable piece of work, and has a receiving radius of about 1,000 miles. A few months ago she went to San Francisco, passed her examination at the customhouse, and was accredited.

Fifteen-Year-Old California Girl, Holder of Federal Radio License, Sitting before Apparatus of Her Own Construction

WHY BATTLESHIPS GO DOWN WITH ALL HANDS ABOARD

In the reports of the British admiralty, subsequent to the great naval action in the North Sea, it was announced that there were practically no survivors of the three big battle cruisers "Queen Mary," "Indefatigable," and "Invincible," which were destroyed, and that in all instances the casualties were large. Contrary to what is apparently the general opinion, this information is not to be wondered at. When a ship goes down during a big battle, its men often go with it. The reason for this is interestingly told by Admiral George Dewey in an article of recent publication. He calls attention to the fact that our navy has of late been besieged with communications from persons, evidently unversed in naval matters, who have ideas concerning the construction of life-saving contrivances of various sorts intended to obviate this heavy sacrifice of life.

The sinking of a battleship in action and the foundering of a merchantman are distinctly different, so far as the chances of those aboard them are concerned. When a war vessel is hit in a vital spot there is usually no way of determining whether it will go to the bottom immediately, stay at the surface for a considerable period, or remain afloat indefinitely. Since the purpose of a battleship is that of fighting, as Admiral Dewey points out, it pounds away at its antagonists so long as it keeps above water and has a gun intact. Every man sticks to his post, fighting just as intensely as if there were a sound bottom beneath him. When the ship finally heels over and slips beneath the waves, there is scarcely a man on deck. Therefore no one has a chance to make use of the life belts and pneumatic rafts which are provided. The fact that a boat, stripped for action, has no room for life craft does not enter into the question. If a few fortunate men have an opportunity to take to the water before it is all over, their belts and adjacent craft will in all probability save them. This occasionally happens.

CURIOUS MOTOR-CAR HORSE RIDDEN IN PARADE

SHOULD the time ever dawn when the horse is extinct, it may be that those who crave for brisk, early morning canters across the hills or along bridle paths will resort to some such device as recently astonished hundreds of spectators during a Massachusetts parade. It was a rare vehicle, intended merely to create a sensation, and consisted of the combination of a life-sized wooden horse and a light motor car. The body of the machine was removed, leaving the chassis, from the cowl back, bare. The model horse, no longer needed as a harness form, was securely mounted on the frame. A hole drilled through its chest permitted the steering column to be extended so that the wheel could be fixed in front of the operator. The clutch and brake pedals and the gear-shift lever were arranged so that they could be worked easily by the rider-driver, who appeared in the usual costume and carried a lash.

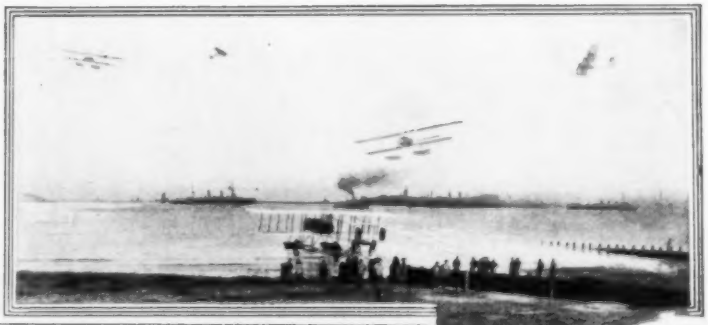
DOZEN WHALES ARE BEACHED NEAR FLORIDA TOWN

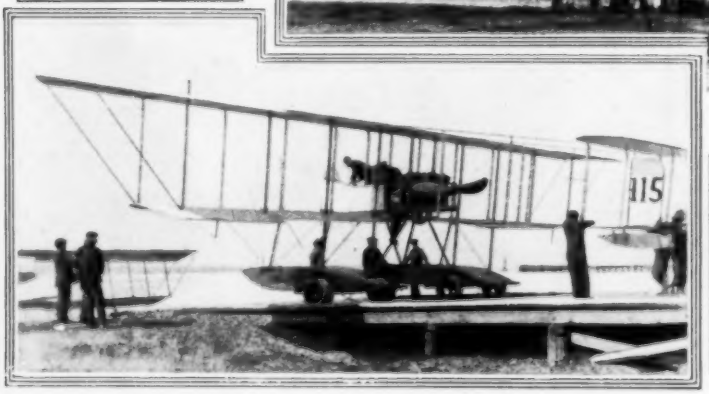
Twelve whales of various sizes, some of them weighing several tons each, were caught in shallow water and carried onto the beach at Pablo, Fla., a few weeks ago. The appearance of so many of these aquatic mammals on the sands at one time caused general excitement, and the town was practically deserted by its inhabitants, all of whom were eager to witness the unusual sight. During certain seasons of the year it is not uncommon for one or two whales to be cast onto the sands somewhere along the coast, but for a whole dozen, a veritable school, to be stranded on a short stretch of beach at one time is more or less rare. Motorists and sightseers from adjacent cities visited Pablo in great numbers. All of the whales were alive when found. They were claimed by local fishermen, who, with the aid of horses, dragged them well up on the beach, away from the water, and shot them. They ranged in length from 12 to 30 ft., and were obviously considered a most lucky catch by the men who came into possession of them.

Recently a Dozen Whales of Different Sizes were Washed onto a Short Stretch of Beach at Pablo, Florida. Several of Them are Shown Here

SEA PLANES AT BRITISH AERONAUTICAL BASE

Squadron of Big Flying Boats Setting Out from the British Navy's Largest Aeronautical Station "Somewhere in England." In Addition to the Craft That is to be Seen Skimming across the Water, Four Machines are Hovering Overhead. In the Background Are Several Naval Vessels





This Shows How the Heavy Sea Planes are Moved between Their Hangars and the Water's Edge. Preparations are being Made Here to Launch the Craft and the Pilot may be Seen Taking His Place in the Cockpit. So Far as is Known These Are the First Photographs of the Station to Escape the Censors

COMMENT AND REVIEW

WE will consume, in this country, this year almost 2,000,000,000 gallons of gasoline; which is the equivalent of a stream six feet wide and one foot deep flowing at the rate of one mile an hour. Five years ago gasoline retailed at 35 cents in England and from 40 to 75 cents on the Continent, and there are those who even predict 40-cent gasoline here some day. Recent improvements in refining have considerably increased the percentage of gasoline extracted, and inventors are confident of perfecting carburetors which will use kerosene; but for the present we are confronted with a decrease in the gasoline content of the older oil wells, and an insufficient capacity in the refining plants. Our exports, however, of gasoline in 1915 were considerably less than in 1914, although more crude oil was sent abroad. There is also a strong probability that, with the reconstruction and resumption of business abroad at the close of the war, consumption there will be much greater than now. Horses will be scarce and time will be everything, and the motor car and truck will receive a great impetus. Just how long the present oil wells will continue to produce, or when and where new oil fields will be discovered, no one can say with certainty. Before that day arrives, however, it is fair to expect that chemists will have found some substitute, or inventors a method of making one gallon do the work of more.

Rivers of Gasoline

TWO years have passed since our regular supply of hundreds of articles which had flowed in an unbroken stream from Europe was stopped. In a few particulars we have produced as good, or nearly as good, an article as we formerly imported. But we are short on countless things, some of which are very essential. Many dyes are not to be had for a king's ransom, and linens and fine leather and a thousand other articles, to the origin of which we never gave a thought, are daily growing scarcer or the supply is entirely exhausted. We have edged in on a few things, but have we come up to the requirements of our unsupplied needs to any considerable extent, as so many confidently boasted we would? That we *can* supply ourselves with pretty much all the necessaries previously imported, is doubtless true. That we have not, and are not, is largely due to labor conditions which, in the absence of suitable protective tariffs, deter our manufacturers from investing the large sums required to erect plants, with the constant danger that the war may end suddenly, imports be resumed, and accumulated stocks on the other side be dumped in large quantities at reduced prices. Take the case of the dyes for example: A German manufacturer can command the services of a highly efficient and experienced chemist, one who has perhaps taught chemistry for years in a technical school, at a salary of $800 a year. Here the manufacturer, for that sum, could scarcely secure a second-year college student with a smattering of

Independence of America

theory and no practical experience whatever. If we are to do these things for ourselves we will be obliged to restore some protecting tariffs, whatever may be our position on protection and free trade as a general proposition.

IN these days practically all the 25,000 tons of paper which we manufacture daily, is made from wood pulp. The writing and bond papers, and a few other high-priced papers, contain more or less "rag," but the paper on which dailies, weeklies, magazines, and books are printed is made from wood. The quantity of the former is but a drop in the bucket of the latter. The wood is made into pulp, and the pulp into paper. This pulp is selling at a price nearly three times that of 18 months ago.

Wood Pulp an Example

A few years ago pulp was put on the free list, with the result that, while our population and the corresponding consumption of paper has steadily increased, there has been very little increase in our pulp-mill capacity. A pulp mill costs from one million dollars up. The war has prevented the normal import of paper and pulp from Canada, Norway, Germany, and Russia to such an extent that the paper used by dailies costs double what it did two years ago. In fact there is a good prospect that many one-cent dailies will have to charge two cents, and some magazine publishers are confronted with the necessity of raising their price at least five cents a copy. Cheaper pulp is the only solution, but American pulp makers dare not put millions into pulp mills with the possibility of the foreign pulp supply confronting them.

This is written as a statement of conditions rather than an argument in favor of high tariffs. The fact is, many commodities were too highly protected in the past, and now some articles are not sufficiently protected.

AFTER the book had apparently closed on the last chapter, and scores of barnacle-covered hulls had lazily rubbed for years at still more neglected docks, Old Neptune raises his trident, and deserted shipyards spring to life. The old hulls are repaired, spars and rigging swing into place, new sails and fresh paint restore what seemed a useless derelict to a thing of beauty and profit. All along the Atlantic coast this transformation is going on, for these rejuvenated craft pay for themselves often with their first cargo. If ships have souls, as poets say, what a thrill of joy must quiver through each timber as, with every stitch of canvas set, they head out to sea once more.

Revival of Shipbuilding

Maine has been a noted shipbuilding state; a century ago it was her great industry; thousands of men fashioned the craft which flew the Stars and Stripes on every sea and ocean. Five years ago the oldest shipbuilder in the state admitted the industry was practically dead. One year ago the shipyards were deserted, and rapidly becom-

ing a mass of rotting timbers and junk. Today an army of men are working to restore these yards, and already keels are laid and frames of three and five-masters are taking shape, in some yards for the first time in 15 years. In five towns alone in Maine 39 vessels are either already on the stocks, or in process of preparation. And the prospects are that this revival is not to be short-lived, for there is a great scarcity of ships throughout the world and the contest for export trade with the close of the war will be terrific. Our poverty of merchant marine had not been generally realized until the war; now that the condition is felt we are starting to repair the damage, but years must elapse before we can take our place with other maritime nations. When the ocean liners of Europe again resume their regular sailings it is doubtful if we can successfully compete in other than coastwise traffic without some substantial subsidies such as other nations extend to their ship companies. Whatever the cost, we, with the longest usable seacoast of any nation, should assume our rightful and necessary place on the seas.

WARS work the most surprising results, and the present war is no exception, and has resulted in two notable conditions; one in England, the other in Russia.

Traditions Lost in War

The daughter of the well-to-do class in England has from time immemorial been hedged about with all manner of restrictions. She has known nothing of the freedom of opportunity which the American girl in the same social level has enjoyed as a matter of fact. The demand for men for enlistment in England has naturally been a heavy drain on all kinds of work which had hitherto been performed almost exclusively by men. This created vacancies in occupations which were possible to be filled by women.

And so today in London one finds, as conductors on the thousands of motor busses, young women, suitably dressed for the work, filling the places made vacant by men who have gone to the front. The passenger elevators in most of the cities are operated by young women. Thousands of motor taxicabs throughout the country are driven by young women. Girls from families of wealth and refinement have left their schools, corresponding to our Wellesley and Vassar, to return home and take positions as stenographers and clerks, who never before in all their lives had even seen a typewriting machine. In cases where the salary they earn is not needed, they donate the entire amount each month to some one of the funds for the relief of wounded soldiers or their families. These girls cannot go to the front, but they make it possible for some young man to do so.

To an American girl this seems no more than the logical, obvious thing to do, and only those who know from personal observation of the severe social restrictions in England will realize what a startling departure from what was the "correct thing" all this really is. The probability—and, from an American viewpoint, the hope—is that when peace is restored, out of it all will come a greatly enlarged life

for English women. Indeed, it seems hardly possible that there can ever be an entire restoration to the old order of affairs.

The other startling condition was the ukase which with one motion converted a vodka-sodden nation to temperance. To take vodka from a Russian peasant was like taking beer from a German, although the former drink was vastly more injurious. The results of this involuntary temperance are reported as most interesting, one of which is a sudden and tremendous increase in savings-banks deposits and accounts, and greatly increased efficiency in the masses. It is pleasing and heartening to have these two pictures, one of patriotism and the other of the better life, to hold up in contrast to the horrible and revolting aspects of the great conflict.

The Jitney Bus

THE jitney-bus fever seems to be abating, and what was recently heralded as destined to displace the street car is itself already on the decline. There are doubtless numerous places where the haul is short and the volume of business large enough for a jitney but too small for a street-car line, where the service will find a field of usefulness and a profitable business. But for the dependable movement of hundreds of thousands daily, expeditiously, safely, and regularly, the car on rails will continue to hold its own in this country. As time goes on and traffic congestion grows, the surface street car will yield somewhat to the elevated or subway in the large cities, but it will not give way to jitneys.

Except on the Pacific coast, where there is a local reason, the jitney is fading away as rapidly as it developed. In only a few instances did any organized company undertake the enterprise. The jitners were for the most part individuals, each out for himself and not financially responsible. Naturally each man wanted to make his earnings as large as possible, which led to fast driving and shortly resulted in accidents to pedestrians. The public then woke up and insisted on these drivers being restrained in their wild driving and put under bonds in case of damage done. Then the jitney ceased to pay.

As so often happens, men utterly inexperienced in handling traffic, after a few hasty figures, jumped at the conclusion that here was a newly discovered gold mine with shares for the price of a cheap car and a few gallons of gasoline. Experience, however, revealed unthought-of expenses and losses. The jitney will pay in certain favored spots, but it will not revolutionize city passenger traffic as many people were led to expect.

H. H. WINDSOR

July 25th

NAVAL MILITIAMEN ON SUMMER PRACTICE CRUISE

Naval Militiamen Lugging Their Personal Baggage aboard the "Kentucky" Preparatory for the Annual Practice Cruise off the Atlantic Coast

Battleship "Kentucky" Coaling in the Hudson River with the Manhattan Battalion of the Naval Militia Aboard. The Vessel Has a Normal Displacement of 11,520 Tons and is Listed in Our Second Line. It was Built in 1898

Amateur Seamen Lined Up on Deck for Inspection before Starting for the Open Sea. During the Several Weeks' Cruise the Men are Put through the Same Routine That Comprises the Day's Work of the Enlisted Men

PHOTOS COPYRIGHT, UNDERWOOD & UNDERWOOD

AFTER THE DISASTROUS CLASH AT CARRIZAL

PHOTO COPYRIGHT INTERNATIONAL NEWS SERVICE
Wounded Corporal, Arm in Sling, Talking with Generals Garcia and Gonzales upon Return to the United States

PHOTO COPYRIGHT INTERNATIONAL FILM SERVICE
Soldier Pallbearers of the Boys Who Heroically Fought and Fell in the Fatal Encounter at Carrizal

PHOTO UNDERWOOD & UNDERWOOD
Performing the Last Rites at Arlington Cemetery over the Bodies of Those Who Died Charging Machine Guns in the Desert

PHOTO COPYRIGHT INTERNATIONAL FILM SERVICE
Wounded Survivor of the Massacre being Removed from Motor Ambulance at El Paso

PHOTO COPYRIGHT UNDERWOOD & UNDERWOOD
Smiling Troopers of 11th Cavalry after Reaching American Soil Following Release from Mexican Prison. Each was Presented with a Bouquet

AND PICTURE STORY OF MEXICAN SITUATION

PHOTO COPYRIGHT UNDERWOOD & UNDERWOOD

When the Break with the Carranza Government Seemed Imminent, Señoras and Senoritas at Mexico City Offered Their Services to the Red Cross and Received Instructions

Motorcyclists on Duty at the Border. Most of the Machines Have Sidecars, and Holsters for Carrying Two Rifles

Battalion of Guardsmen Lining Up at San Antonio for First Mess after Detraining for Hike to Fort Sam Houston

PHOTO COPYRIGHT INTERNATIONAL FILM SERVICE

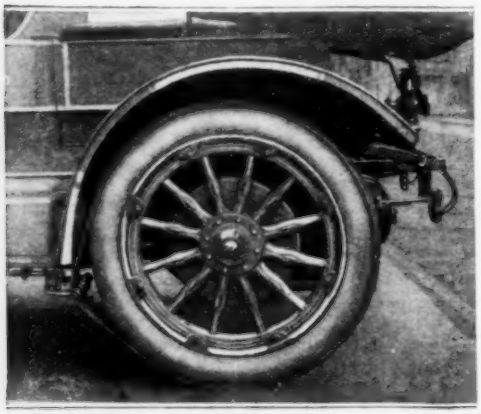
First Aero Squadron of the New York National Guard Mustered In for Federal Service: The First Militia Flying Unit to Join the Regulars

PHOTO COPYRIGHT UNDERWOOD & UNDERWOOD

Refugees aboard the "Nebraska" in Mexican Waters: When the Government Warned Americans to Leave the Southern Republic, Hundreds Sought the Protection of Our Battleships

BELTS CIRCLE CAR'S TIRES AND PREVENT SKIDDING

To increase the traction of a motor car's driving wheels when sand or rough roads are encountered, and also



In Addition to Making Driving Easier on Heavy Roads, the Belts Save the Tires and Increase the Gasoline Mileage

to prevent skidding on wet pavements, a Washington state man has devised a tire belt which is apparently effective. This is made of a heavy fabric and passed around a tire and over a small pulley mounted to the under side of the running board. Belts are applied to each of the rear wheels and save the wear and tear on tires, almost doubling, it is said, their mileage and materially decreasing fuel consumption on heavy roads. As is evident, the belts serve as a continuous track which the wheels can grip and hold to without slipping. During tests on slick pavements, a car thus equipped has been brought to a quick stop, from a speed of 25 miles an hour, without showing any tendency to skid.

SCALE DEPOSITS PREVENTED BY METALLIC PAINT

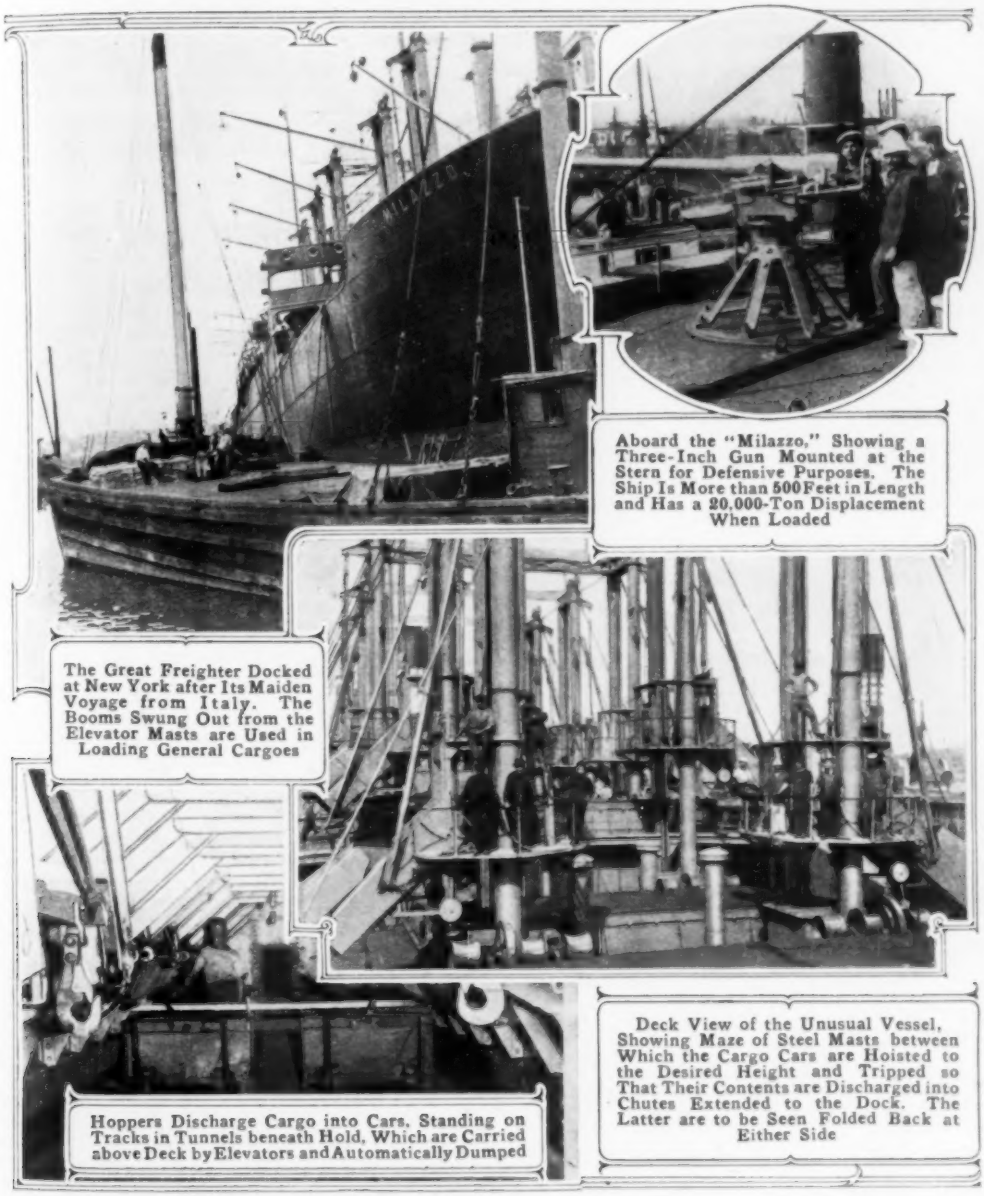
It has been found that by coating the interior of a vessel with aluminum paint, the sediment present in hard water is prevented from depositing itself upon the walls. Some time ago the inlet pipe of a water bath in the chemical laboratory at the Academy of Sciences, Paris, became clogged by a formation of this kind. Experiments were conducted in an endeavor to find some means of prevention, the result being that the value of aluminum paint in this connection was found. A container thus treated can be used for two or three years without necessarily being cleaned, it is reported.

CONVENIENT DRESSING TENT FOR SUMMER BATHERS

Portable dressing inclosures of an inexpensive, easily made type are being used on the beaches at Alameda, Calif., by bathers who reside some distance from the shore and find it inconvenient to go to and from the water in swimming costumes. One of these screens has a collapsible wooden framework about which a strip of canvas is stretched. It is approximately 6½ ft. in height and 3 ft. square, offering just enough space to accommodate one person at a time. On the inside large pockets are sewed in place to receive one's clothing and other personal belongings while they are not in use. Guy ropes, extended from the four upright posts, support the device when it is necessary to brace it against the wind. Upon being dismantled, it can be rolled into a compact bundle and stowed away in a car.

When Collapsed, This Shelter may be Rolled into a Compact Bundle Which Occupies but Little Space in a Car

NEW UNLOADING EQUIPMENT USED BY BIG FREIGHTER



Aboard the "Milazzo," Showing a Three-Inch Gun Mounted at the Stern for Defensive Purposes. The Ship Is More than 500 Feet in Length and Has a 20,000-Ton Displacement When Loaded

The Great Freighter Docked at New York after Its Maiden Voyage from Italy. The Booms Swung Out from the Elevator Masts are Used in Loading General Cargoes

Hoppers Discharge Cargo into Cars, Standing on Tracks in Tunnels beneath Hold, Which are Carried above Deck by Elevators and Automatically Dumped

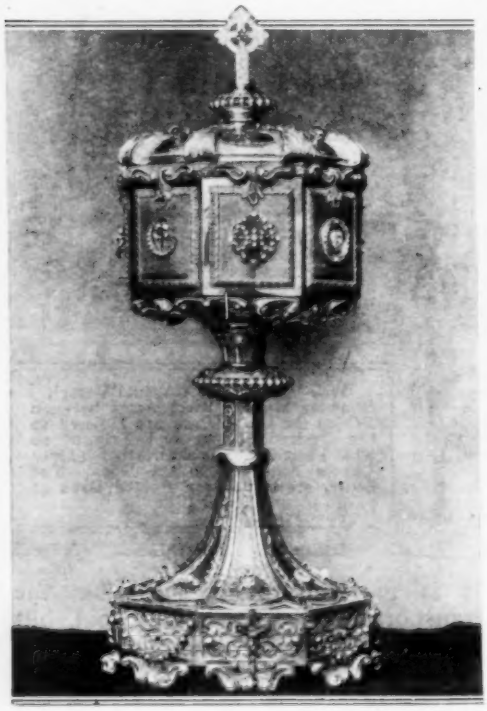
Deck View of the Unusual Vessel, Showing Maze of Steel Masts between Which the Cargo Cars are Hoisted to the Desired Height and Tripped so That Their Contents are Discharged into Chutes Extended to the Dock. The Latter are to be Seen Folded Back at Either Side

About midsummer the Italian cargo boat "Milazzo," undoubtedly the largest freighter on the seas, completed its maiden voyage from Naples to New York. The vessel is of special interest because of its remarkable unloading facilities which enable its 14,000-ton cargo to be discharged within 48 hours. It is particularly designed for the transportation of grain and coal, but because of current conditions is now carrying a general cargo. The ship is 512 ft. in length, 65.8 ft. across the beam, and when loaded displaces 20,040 tons. Its single screw is turned by a 4,000-hp. quadruple-expansion engine.

The steel floor of the cargo hold is shaped like two "W's" placed side by side, and beneath the middle part of each "W," extending longitudinally between long rows of hoppers through which the cargo is discharged into small cars, is a two-track tunnel. Forming a double row forward and aft on opposite sides, there are 22 elevator shafts. The filled cars are hoisted by steam power through these to the necessary height above the deck and then automatically dumped so that their loads are dropped into chutes leading to the dock or lighters, as the case may be. Below deck each of these elevator shafts is divided so as to serve cars on both tracks. Extending above them on deck are parallel steel masts with proper guides which enable the cars to be lifted to the desired height. Obviously chutes, which are hinged to platforms held by these masts, may be extended at various angles, while their height above the deck can be regulated by raising or lowering the supporting columns. When not in use the chutes are swung up and back so that the deck is not obstructed. In addition to facilitating the unloading of the vessel, the queer shape of the hold tends to prevent the cargo from shifting at sea. Booms swung out from the steel uprights are used in loading general cargoes. The "Volturno," a sister ship of this one, is nearing completion.

JEWELS AND TRINKETS FORM ELABORATE CIBORIUM

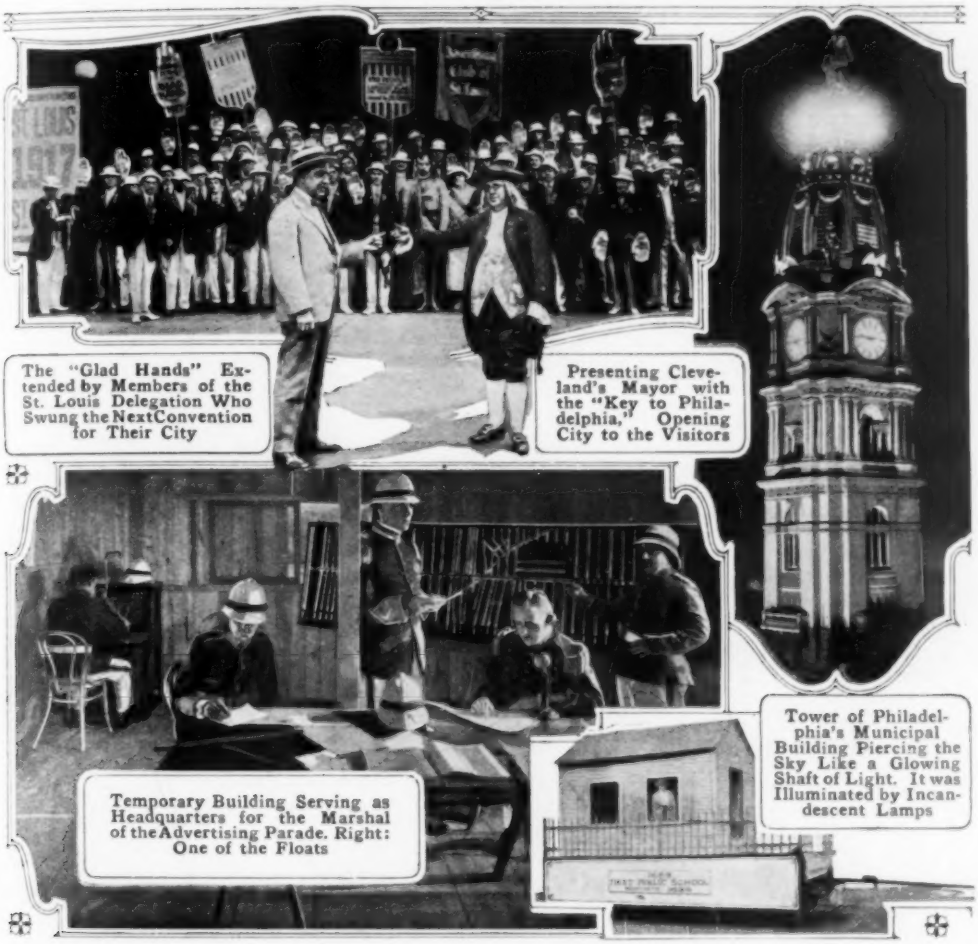
More than 1,500 separate pieces of jewelry were contributed at Baltimore to be used in the construction of a rich golden ciborium, thickly set with precious stones, which was recently presented to the priest of a local Roman Catholic church. The vessel is valued at several thousand dollars and is entirely hand-wrought. The gifts forming the material with which it was made consisted of miscellaneous ornaments, some of them heirlooms of considerable value. Cuff links, spectacle frames, shirt studs, bar pins, brooches, rings, chains, necklaces, fobs, and stones classify some of the many articles of personal adornment which went to the goldsmith to be, in the case of the metal, melted and hammered into the ciborium. One of the contributions was a sunburst set with 29 diamonds. Instead of destroying this, the piece was mounted in the center of one of the seven panels forming the walls of the bowl. Certain other pieces of jewelry were similarly employed to ornament the vessel. A rare old necklace of gold beads, for instance, was preserved by the designer, who used it to encircle both the crowning part of the cover and an ornamental band near the upper extremity of the pedestal. An especially beautiful rosary was kept intact by linking it about the base of the piece. The vessel is set with nearly 200 jewels, the majority of which are diamonds.



JENKINS & JENKINS, DESIGNERS

This Costly and Ornate Ciborium, Presented to a Baltimore Priest, was Made from Some 1,500 Pieces of Jewelry Contributed for the Purpose

ELECTRICITY PLAYS PART IN AD MEN'S CONCLAVE



The "Glad Hands" Extended by Members of the St. Louis Delegation Who Swung the Next Convention for Their City

Presenting Cleveland's Mayor with the "Key to Philadelphia," Opening City to the Visitors

Temporary Building Serving as Headquarters for the Marshal of the Advertising Parade. Right: One of the Floats

Tower of Philadelphia's Municipal Building Piercing the Sky Like a Glowing Shaft of Light. It was Illuminated by Incandescent Lamps

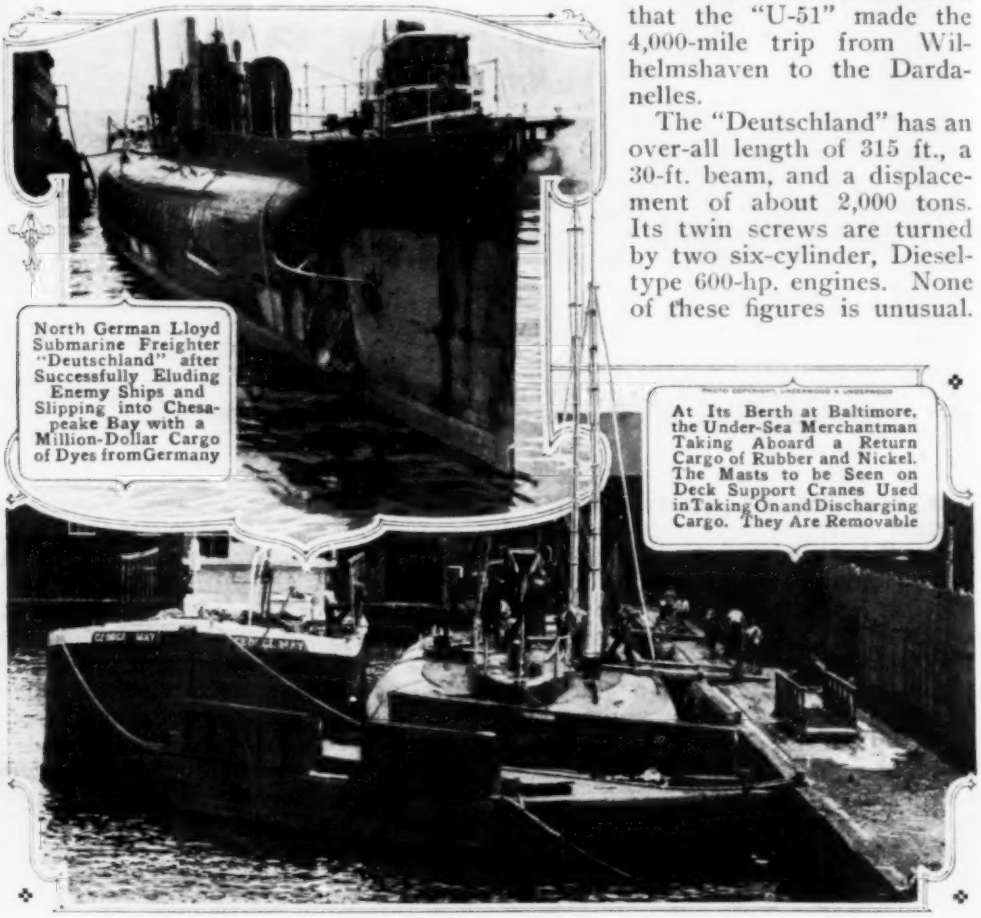
Many of Philadelphia's buildings were brilliantly illuminated during the annual convention of the Associated Advertising Clubs of the World, which was held at the Quaker City during the latter part of June. One of the noteworthy instances of this was the great tower of the municipal hall, which is surmounted by a statue of William Penn, 548 ft. above the street level. This was bathed nightly in a flood of light produced by eight batteries of large incandescent lamps mounted in different positions so as to play on all parts of the massive structure. For this purpose approximately 300 lamps, each of 500 cp. and backed by a reflector, were employed. The two spectacular events of the conclave were the parade and water pageant, each of which was staged at night under the glare of brilliant lights. Thousands of dollars were expended upon scores of ingenious and elaborate floats entered by various national and local advertisers. The parade, which was a large affair, was regulated from a central station by telephones and a railroad dispatch board. Ten telephone stations were established along the line of march, and from these points information was transmitted to headquarters, and the orders issued by the marshal executed.

GERMAN UNDER-SEA FREIGHTER "DEUTSCHLAND"

CARRYING a million-dollar cargo composed chiefly of dyestuffs, the North German Lloyd submarine merchantman, "Deutschland," emerged from the darkness off Cape Henry early in the morning, July 9. Before the following midnight it arrived at quarantine, four miles below Baltimore, safe after a sensational, although uneventful, 16-day voyage of about 3,800 miles across the Atlantic. This, the first under-water freighter ever used in commerce, thus eluded enemy war vessels that for days had waited restlessly off the Virginia Capes to prey upon it, and completed its epoch-making journey into American waters.

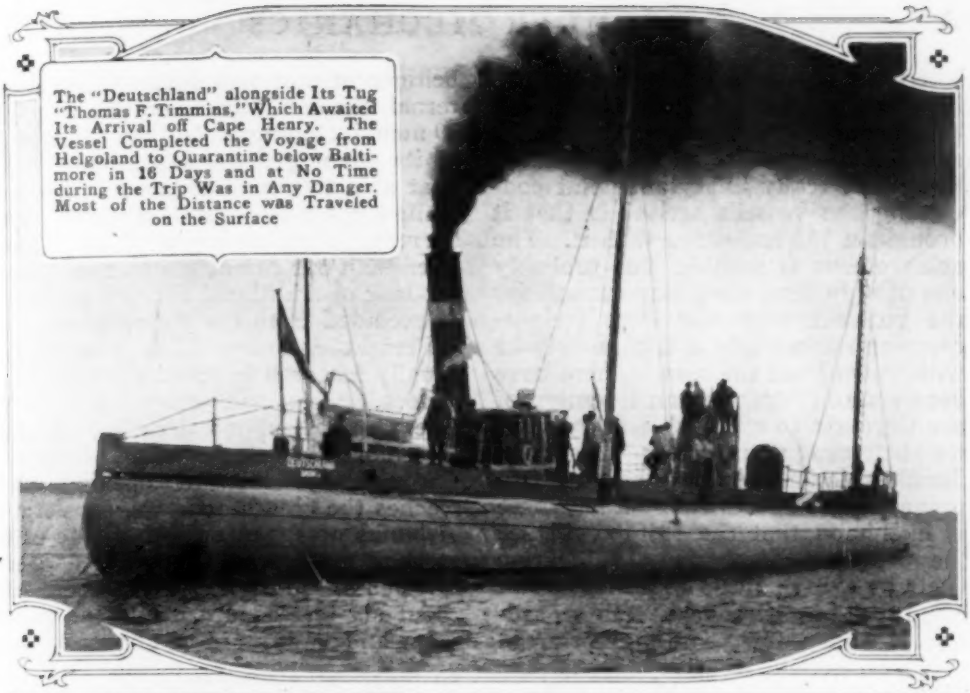
Excluding great disasters and battles, no maritime event in recent years has created such a stir either here or abroad as the docking of the "Deutschland" at Baltimore. In weighing the true importance of this ship's visit from blockaded Germany, however, there are a number of things requiring consideration which at the outset were apparently overlooked by the majority of Americans. Although remarkable, to be sure, the successful passage of the craft was not unique. Months ago 10 American-made submarines put out from Montreal for Portsmouth, an approximate distance of 3,600 miles, and reached their destination without mishap. Some of these craft were then immediately dispatched to the Dardanelles, making a total voyage of some 7,000 miles. German under-sea boats have cut their way to the Ægean and other distant waters, and it will be remembered that the "U-51" made the 4,000-mile trip from Wilhelmshaven to the Dardanelles.

The "Deutschland" has an over-all length of 315 ft., a 30-ft. beam, and a displacement of about 2,000 tons. Its twin screws are turned by two six-cylinder, Diesel-type 600-hp. engines. None of these figures is unusual.



North German Lloyd Submarine Freighter "Deutschland" after Successfully Eluding Enemy Ships and Slipping into Chesapeake Bay with a Million-Dollar Cargo of Dyes from Germany

At Its Berth at Baltimore, the Under-Sea Merchantman Taking Aboard a Return Cargo of Rubber and Nickel. The Masts to be Seen on Deck Support Cranes Used in Taking On and Discharging Cargo. They Are Removable



The "Deutschland" alongside Its Tug "Thomas F. Timmins," Which Awaited Its Arrival off Cape Henry. The Vessel Completed the Voyage from Helgoland to Quarantine below Baltimore in 16 Days and at No Time during the Trip Was in Any Danger. Most of the Distance was Traveled on the Surface

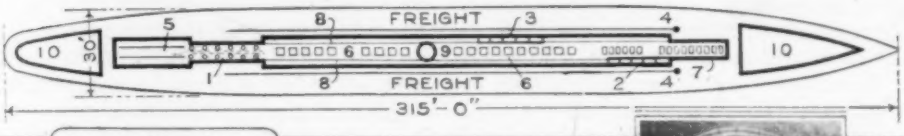


Diagram Gives Idea of Interior Arrangement of Boat: 1, Motors; 2, Officers' Quarters; 3, Kitchen; 4, Disappearing Masts; 5, Diving Mechanism; 6, Engine Room; 7, Storage Batteries beneath 6; 8, Alley Ways; 9, Conning Tower; 10, Cargo Spaces

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Captain Koenig, Who Brought the First Merchant Submarine "Deutschland" across the Atlantic

PHOTO COPYRIGHT, G. V. BUCK

Showing the Deck, Conning Tower, and Some Members of the "Deutschland's" Crew. No One aboard the Vessel, Not Even the Captain, had Navigated an Under-Sea Boat Previous to Going aboard This One. Each Is an Experienced Sailor, However, and was Given Instructions at Helgoland

There are several submersibles, doubtless many—some of them of German construction—which are of greater size. So, when it is all simmered down, the really important point concerning the vessel's arrival is that it brought a 750-ton cargo with it. The achievement is notable, but probably one of only temporary importance, for the moment that war ends freight-carrying submarines will obviously be withdrawn from the seas. There have been rumors regarding an intention of the Germans to establish weekly service between their ports and ours. Should this actually develop, and also prove to be a successful venture, there is likelihood that the future will see the creation of merchant submarine fleets by great powers as a measure of commercial preparedness. But regardless of what a few years may bring in this connection, the voyage of the "Deutschland" appears chiefly to be a war-time triumph.

According to statements credited to the "Deutschland's" captain, the craft left Bremerhaven June 14, sailing to Helgoland. There it remained for nine days while all hands, none of whom had ever navigated an under-water boat, familiarized themselves with the management of its mechanisms. On June 23 the voyage to Baltimore was begun by slipping through the Straits of Dover, passing the English Channel, and breaking into the open sea. At no time during the cruise was the vessel in any apparent danger. Most of the distance, except that through enemy waters, was made on the surface. When it left Helgoland it had 180 tons of oil aboard. Only 85 tons of this was consumed during the journey, while half of a 20-ton supply of fresh water was used. It carried food supplies for several months, and some 200 tons of scrap iron as ballast.

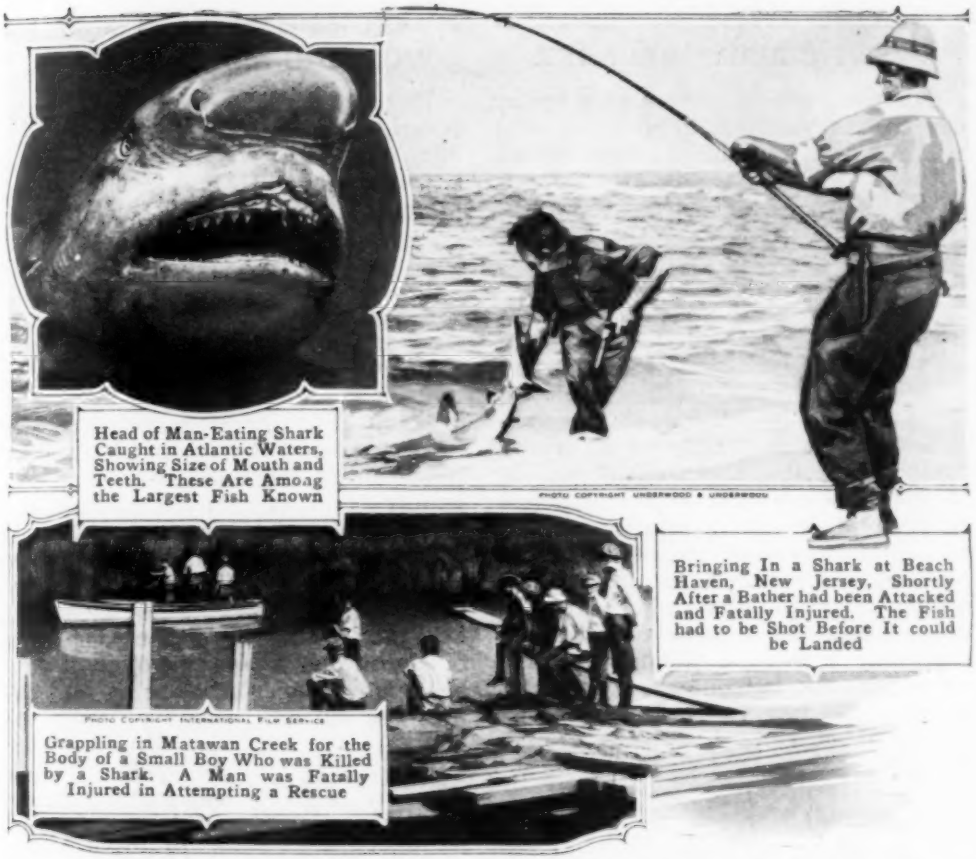
The vessel was constructed at a cost of about $500,000. Its design, according to one of our foremost submarine builders, is religiously American, for American plans, it is claimed, were employed in its development. It is unarmed and could not be made fit for belligerent purposes without many internal changes. Its crew consists of 29 men, including three officers. Ahead of its conning tower is carried a lifeboat able to accommodate 23 persons, while abaft is another boat suitable for six men. With these provisions it complies with our recent seaman's act, but for lack of additional lifeboat capacity is excluded from carrying passengers.

Freight is stowed in the space usually reserved in submarines for torpedoes, guns, and other munitions. The vessel has one deck below and is entered through three hatches. Through the forward opening one reaches the crew's quarters, consisting of bunks arranged on either side of a passage leading to the officers' compartments. The captain's room is about six feet square, while the mess room and galley are of about similar size. Cargo winches, tackle, removal masts, periscopes, two sets of microphones—with which the presence of enemy vessels is detected when submerged—and means for making soundings include some of the equipment.

As this is written, the "Deutschland" is beginning its third week in American waters and with a return cargo is still awaiting an opportunity to slip past French and British warships hugging the three-mile line off the Virginia Capes, and make its way back to Bremerhaven. The return trip will undoubtedly establish, one way or the other, the practicability of maintaining frequent service to various nations by Germany. There is no indication that our government considers that the voyage of the "Deutschland" has proved the British blockade ineffective. With scores of such vessels in successful operation, however, the complexion of matters might be changed.

SHARKS MANGLE AND KILL NEW JERSEY BATHERS

Several persons were killed and one or two others horribly injured during the first two weeks of July as a result of astonishing attacks upon bathers by sharks in the waters of New Jersey.



Head of Man-Eating Shark Caught in Atlantic Waters, Showing Size of Mouth and Teeth. These Are Among the Largest Fish Known

Bringing In a Shark at Beach Haven, New Jersey, Shortly After a Bather had been Attacked and Fatally Injured. The Fish had to be Shot Before It could be Landed

Grappling in Matawan Creek for the Body of a Small Boy Who was Killed by a Shark. A Man was Fatally Injured in Attempting a Rescue

Such tragedies, so far as is known, have never before occurred anywhere in that vicinity, and the appearance of man-eating fish in the surf and even inland creeks has caused general bewilderment and excitement. On the heels of the attacks scores of fishermen reported killing sharks at different offshore points. Many of these assertions were unquestionably false, but a number of the big fish were actually captured and in several instances brought ashore. At Beach Haven, where one bather suffered fatally from an encounter, two sportsmen, a day or so later, landed a shark on the beach with a hook and line. The most startling attack on swimmers was made in Matawan Creek, a shallow inlet, approximately 16 miles from the sea, where a boy was killed outright, a man who started to his rescue injured so seriously that he died a few hours afterward, and another boy—who at the present writing is on the verge of death—badly bitten. The reason for the appearance of the sharks so far has seemingly been given no authoritative explanation. Scarcity of food and the great decrease in transatlantic travel are possibly contributing causes.

TWENTY-FOUR HOUR RECORD CAPTURED BY U. S. CAR

Driving an American-made, six-cylinder machine, Ralph Mulford established a new 24-hour world's motor-car record by covering 1,819 miles on a New York speedway some time ago. His feat swept away the previous mileage record of S. F. Edge, an English sportsman, who in 1907 drove slightly more than 1,581 miles in the same time on the Brooklands track. Mulford kept up an even speed from start to finish.

LIGHTING SWITCH COMBINED WITH CIRCUIT BREAKER

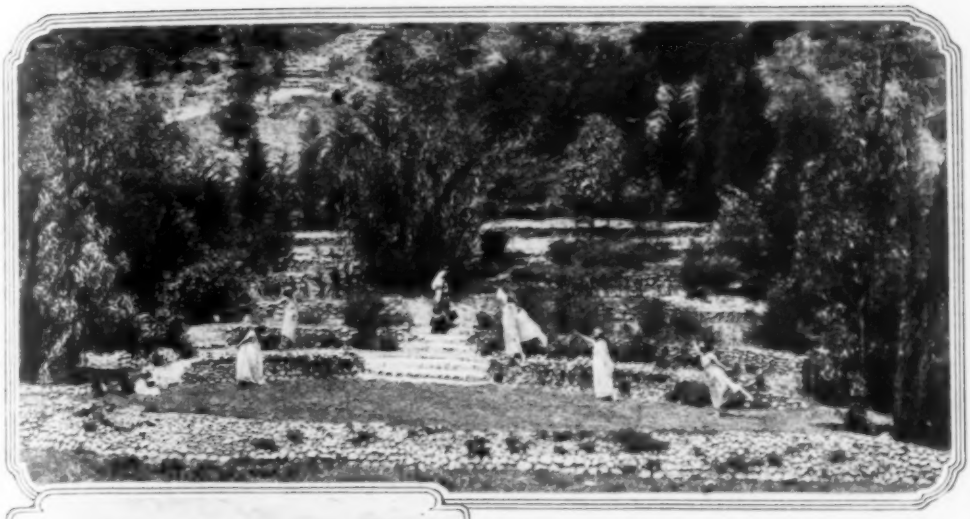
For the lighting system of a motor car an automatic switch, which also serves as an overload circuit breaker, replacing the customary fuse block, is being introduced. It eliminates the trouble caused when a fuse is blown, for to reëstablish a circuit it is only necessary to press a button. The switch is operated by means of a key which one removes upon leaving his car, and this makes it impossible for the lights to be tampered with. A turn to the left ignites the small bulbs and tail lamps—or connects the dimmer coils, as the case may be—while the large lamps as well as the tail one are ignited by moving the key in the opposite direction. Although combining dual features, the appliance takes up no more space on the instrument board than does an ordinary switch and is as easily operated.

HURRICANE SWEEPS MOBILE, WORKING SERIOUS HAVOC

During the middle part of summer a severe tropical storm swept over Mobile, Ala., killing a score of persons and damaging property to the extent of several million dollars. The hurricane lasted for about 24 hours and for a period maintained a velocity of 107 miles an hour. Hardly a building in the city, or in its immediate vicinity, escaped injury. Many structures were destroyed, the roofs of others carried away, and hundreds of windows broken. The losses were materially increased by a flood which followed on the heels of the hurricane. Approximately 11 in. of rain fell in 48 hours. Mobile Bay rose 27 in. higher than its previous maximum record, causing the wholesale district of the city to be deluged to a depth of about eight feet at some points. More than 5,000 bales of cotton and a large amount of timber floated from the wharves into the business section, some of it even being carried on to the gulf. Mobile was completely isolated from the rest of the world. Wireless communication was prevented by the destruction of the local aerials; telegraph and telephone lines were destroyed and railway service stopped.

Pleasure Boats, Barges, and Other River and Bay Craft were Demolished during the Severe Storm, Which Kept Persons from the Streets for 24 Hours

Here is Shown a Small Part of $500,000 Worth of Cotton That was Carried by the Water into the Business District of Mobile. In the Background a Sailboat is Shown High and Dry



Landscaped Terraces Form the Beautiful Natural Scenery that Backs the Stage of San Diego's New Outdoor Theater Which was Recently Opened to the Public

The Sides of a Small Cañon, Which Is within Easy Access of Street-Car Lines and Motor Roads, Provide a Magnificent Site for the Open-Air Theater Now in Use

OUTDOOR THEATER IS BUILT IN CALIFORNIA CAÑON

At a cost of about $7,000 the floor and opposing slopes of a cañon at San Diego have been converted into an artistic open-air theater where both classical and modern plays, pageants, and ballets are produced. A semi-circular stage, 30 by 60 ft. in size, has been constructed near the base of one of the hills. Back of it are landscaped terraces that form the natural scenery. Dressing places for the performers are provided on either side of the stage, while seating space for thousands of spectators is available on the gentle slope of the opposite hill. A creek bed, which during most of the year is dry, separates the stage from the rest of the theater. The place is within easy access to transportation lines, while a road extending through the cañon permits motorists to reach the lower tiers of seats without descending the hill from the street above. The theater was opened at the outset of the summer with "The Blue Bird," which was followed by Shakesperean dramas and a number of modern plays.

SOLUBLE GOLF-BALL TEES TO TAKE PLACE OF SAND

Tees which are soluble and so will not litter up the ground if left on a golf course, have been invented not only with that advantage in view but also to do away with the handling of wet sand that often is unclean. These tees possess the further advantage of being uniform in size and shape; they are made of gelatin, which soon dissolves and disappears if exposed to the weather.

AMERICA'S ATTRACTIVE COUNTRY CLUBHOUSES

Bunker Protected with Railroad Ties, One of the Novel Hazards on the Brookline Links

Quiet, Restful Home of Brookline Country Club Which Supports One of the Most Interesting and Popular of Massachusetts' Many Golf Courses

Attractive New Bungalow of the Portland Country Club on the Maine Coast Overlooking the Ocean

Artificial Hazards are Not Needed on the Mt. Kineo Links, a Nine-Hole Course on Moosehead Lake, Known as Sportiest in Maine

Both Yachting and Golf are Enjoyed by Kineo Members Who Occupy This Pleasing Clubhouse, Beautifully Situated at the Water's Edge and Overshadowed by Mountains

At Bangor, Maine, the Bangor Golf Club and Conduskeag Canoe Club have Joined in Erecting This Trim Little Residence on a Promontory above the Penobscot River. The Course is Building

Here Is the Toughest Hazard of the Poland Springs, Maine, Course: A Meadow Brook That Requires a Clean 125-Yard Drive

Trees, Water, and Bunkers Surround the Elevated Green at the Eighth Hole on the Links of the Kebo Valley Club, near Bar Harbor

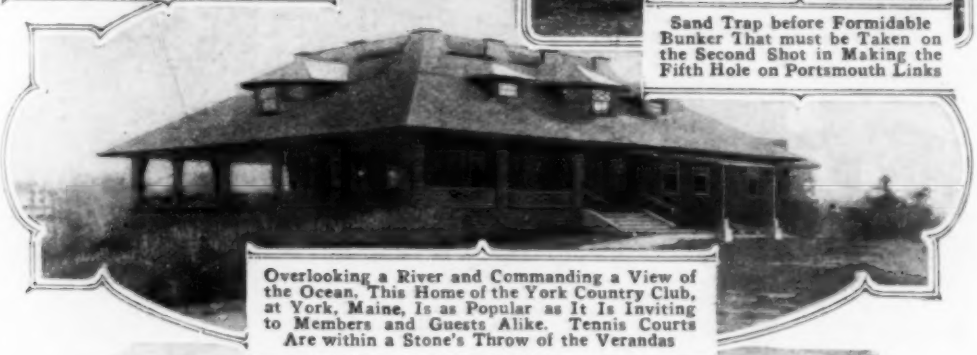
AND SOME OF ITS BEST-KNOWN GOLF COURSES

Both the New Home and the Golf Links of the Essex Country Club at Manchester, Massachusetts, Appeal to Discriminating Players the Country Over

Sixth Hole on Springfield, Massachusetts, Country Club's Course Is Worth the While of a Good Golfer. Green Is High and Blocked by Water and Bunkers

Simple, Unpretentious Quarters of the Portsmouth Country Club in New Hampshire's Hills. Its Nine-Hole Course Has a Surprise before Every Green

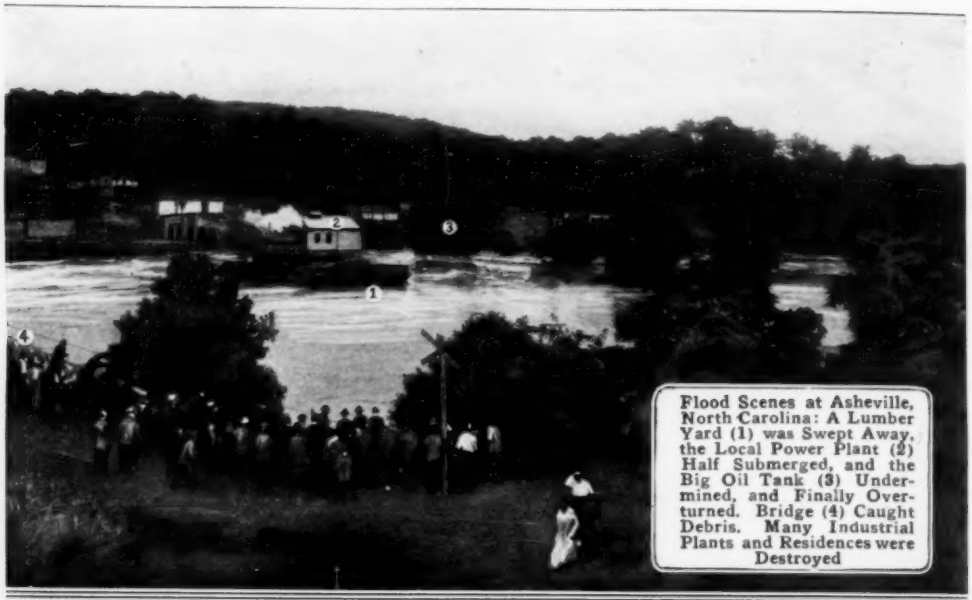
Sand Trap before Formidable Bunker That must be Taken on the Second Shot in Making the Fifth Hole on Portsmouth Links



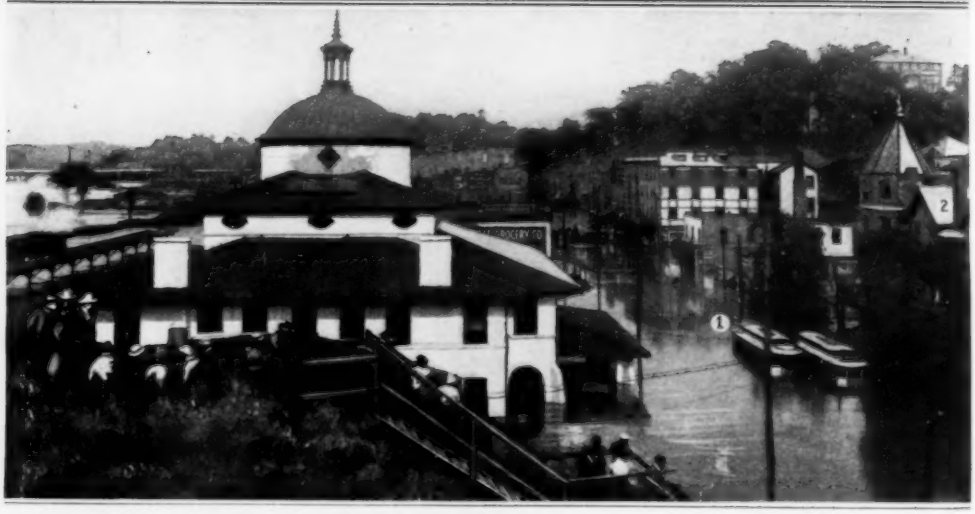
Overlooking a River and Commanding a View of the Ocean, This Home of the York Country Club, at York, Maine, Is as Popular as It Is Inviting to Members and Guests Alike. Tennis Courts Are within a Stone's Throw of the Verandas

This Exasperating Ravine, Bordered by Rough Ground, Usually Puts Par Out of the Question for Eleventh-Hole Players

Woe Greets the Unwary Golfer Whose Ball is Caught on the Second Shot by This Hazard, Which Makes York's Thirteenth Hole Interesting



Flood Scenes at Asheville, North Carolina: A Lumber Yard (1) was Swept Away, the Local Power Plant (2) Half Submerged, and the Big Oil Tank (3) Undermined, and Finally Overturned. Bridge (4) Caught Debris. Many Industrial Plants and Residences were Destroyed



Southern Railway Depot and Asheville Business Street under Water. The River is Seen at the Left. Two Men were Drowned near the Street Cars (1) in Attempting to Deliver Supplies to a Marooned Hotel (2)

SOUTHERN STATES DELUGED BY SERIOUS FLOODS

Following the terrific hurricane that swept the lower Atlantic coast about the middle of July, torrential rains fell in five southern states, flooding scores of cities, drowning many persons, and damaging property to the extent of at least $15,000,000. North and South Carolina, Virginia and West Virginia, as well as Tennessee, were held in the grip of the storm for days. At Asheville, N. C., the fashionable resort city, 25 industrial plants were destroyed, according to reports. These included a number of cotton and lumber mills. In the lower section of the city some 60 residences were swept away, and fully 400 persons made homeless. Charlotte, N. C., was plunged in darkness and its mills put out of commission. Many railway lines and bridges were washed out.

THE WORLD'S GREATEST SEA FIGHT

How the Supreme Naval Battle of History was Fought off Jutland's Coast and What It Teaches—The Last Glimpse of Lord Kitchener, Victim of the Ill-Fated "Hampshire"

DURING the summer two maritime events of utmost importance drew universal attention to the North Sea. One was the colossal clash of the world's matchless sea forces, off the coast of Jutland; the other, the loss of the battle cruiser "Hampshire," west of the Orkneys, with Lord Kitchener and his staff aboard.

Neutrals are not so much concerned with the question of the victor as with the significant lessons unfolded by the engagement of the British grand fleet and the German high-seas fleet. For the first time, modern naval engines were pitted against each other in a terrific death struggle, the supreme sea fight of the ages. The massive dreadnaught, the swift cruiser, and the mosquitolike destroyer were brought into play, and their actual capabilities given the initial, telling test. Likewise the submarine and air craft assumed rôles which previously they had little more than rehearsed.

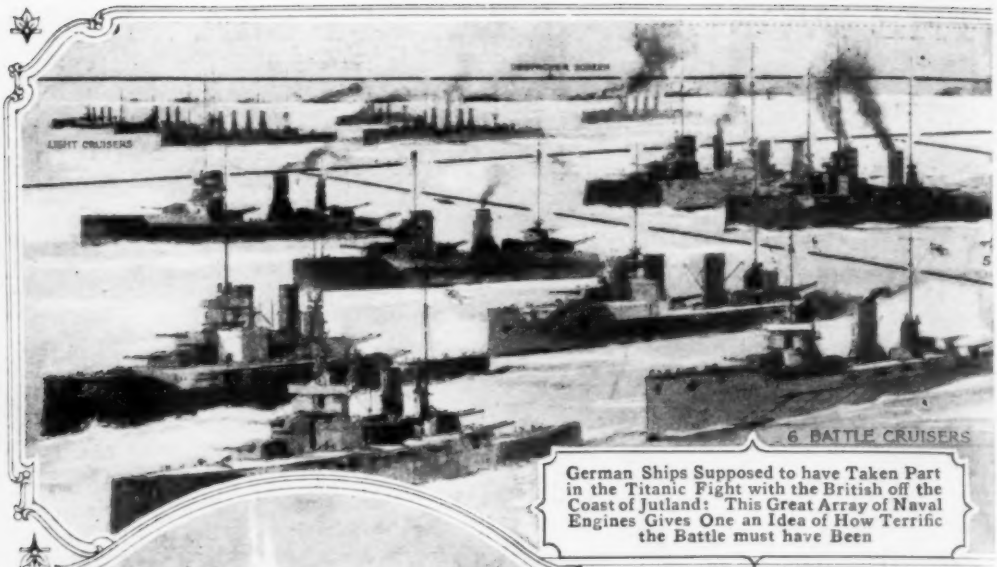
As a whole, the battle has vindicated the contentions consistently voiced by our general board in its annual recommendations to the secretary of the navy. It has proved the superiority of the heavily armored dreadnaught; the tactical value of the cruiser, and also the latter's utter inability to face big guns; the usefulness of the agile destroyer for striking quick, telling blows even in daylight, and the ability of big battleships to resist torpedo attacks. It has convincingly disclosed the fallacy of placing reliance in any one type of vessel to the extent of ignoring others, and has shattered the hasty assumption, expressed early in the war, that the submarine sounds the death knell of the dreadnaught.

Our clearest accounts of the battle come from Vice Admiral Sir John R. Jellicoe's official report to the British admiralty. Germany's statements have been confusing, partly, no doubt, because of its difficulty in transmitting communications direct to the outside world. We know, however, that Berlin claimed a victory before the British admiralty made its first announcement, that Germany was astounded when its naval staff later admitted the loss of vessels previously declared to be safe, and are informed of the isolation of Wilhelmshaven and the exclusion of civilians from that base upon the return of the battle-scarred fleet.

Great Britain acknowledges the loss of 14 vessels having an aggregate tonnage of 112,350. These consisted of the battle cruisers "Queen Mary," "Indefatigable," and "Invincible;" the armored cruisers "Defense," "Black Prince," and "Warrior," and the destroyers "Tipperary," "Turbulent," "Fortune," "Sparrow-Hawk," "Ardent," "Nomad," "Nestor," and "Shark." Germany has admitted the destruction of the battleship "Pommern," and the cruisers "Wiesbaden," "Frauenlob," "Elbing," and "Lützow." England makes two estimates of the enemy's losses, claiming that vessels totaling 109,220, or 118,220 tons were sunk. Admiral Jellicoe expresses the belief that Germany's injuries amounted to the destruction of one dreadnaught of the "Kronprinz" type, one of the "Helgoland" type, the battleship "Pommern," the battle cruiser "Lützow," five "Rostocks," six destroyers, and one submarine.

Regardless of the contentions of either side, the losses appear to have been about as great in one case as in the other. The points of real significance are that the German fleet failed in its avowed purpose to break the bonds that bottled it up, and in the midst of battle retired under cover of darkness and fog, leaving the British navy in undisputed mastery of the sea.

Owing largely to atmospheric con-



German Ships Supposed to have Taken Part in the Titanic Fight with the British off the Coast of Jutland: This Great Array of Naval Engines Gives One an Idea of How Terrific the Battle must have Been

FROM THE SPHERE, LONDON. COPYRIGHTED IN THE

ditions, amounting to low visibility, the action occurred at close range. This precludes any deduction as to the relative merits of the heavy guns involved. The opening shots were fired at a range of 10.5 miles, but those were few. Vessels within 2.8 miles of each other shot broadsides, while the average range of the fight was about 5.6 miles, a distance at which all guns are effective.

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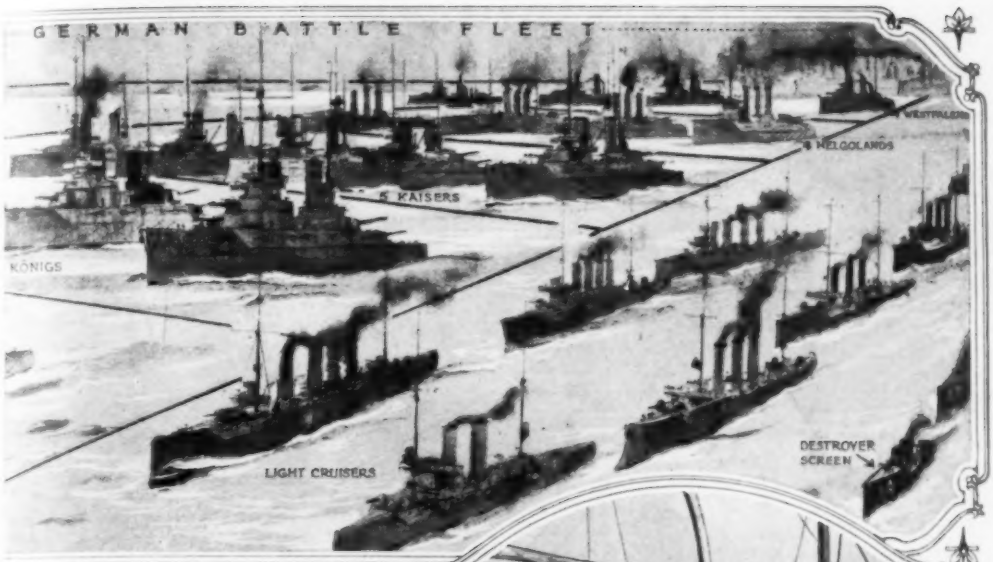
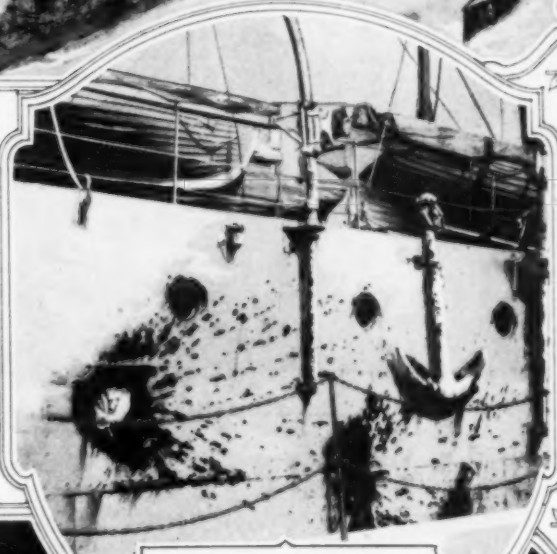
The British Destroyer "Shark," Fighting to the Death: Just Before It Disappeared below the Waves It Fired Its Last Available Torpedo at the Enemy

FROM THE SPHERE LONDON. COPYRIGHTED IN THE



UNITED STATES BY THE NEW YORK HERALD COMPANY

At 2:20 o'clock on the afternoon of May 31, the presence of enemy vessels, accompanied by Zeppelins, was reported by a British scout boat. At 3:31 o'clock the enemy was sighted, led by five battle cruisers. Two light-cruiser squadrons under Vice Admiral Beatty swept toward the east, screening the advance of the battle-cruiser squadron under Admiral Evan-Thomas. The Danish coast



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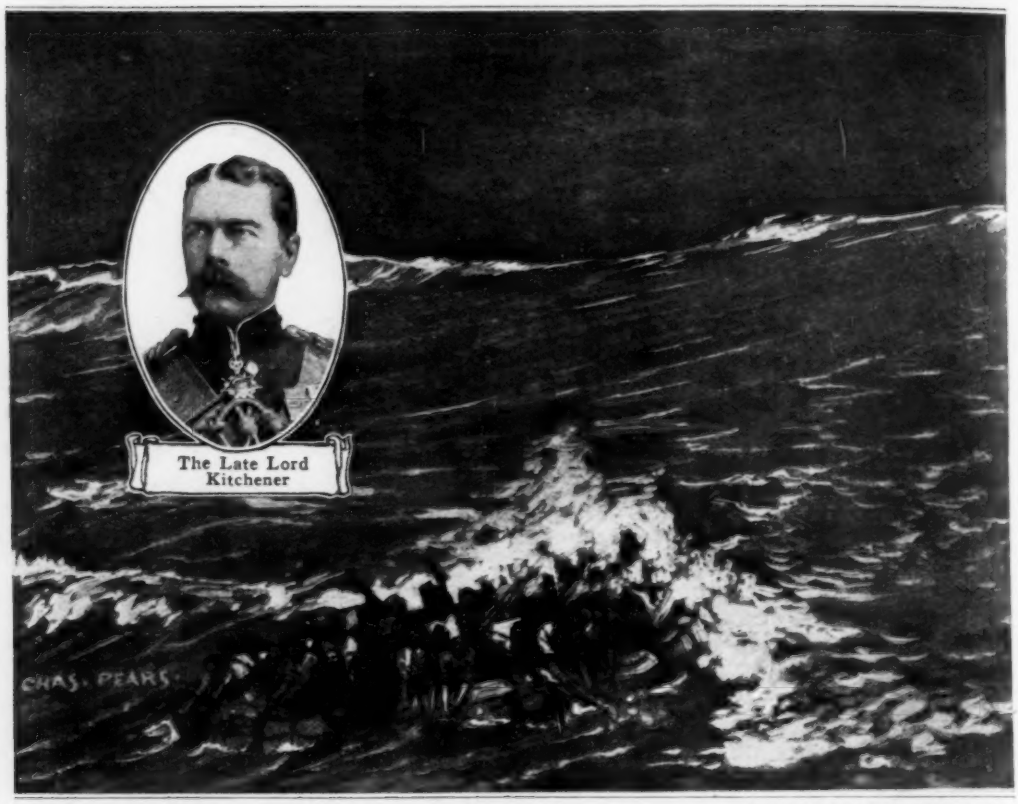
Shell-Scarred Side of a British Vessel Following the North Sea Battle. The Hole at the Left is Plugged with Bedding

The Final Phase of the North Sea Battle: As Darkness Came On and the Germans Withdrew, the Swift Destroyers of the British Darted Forth and Fought Desperately at Close Range



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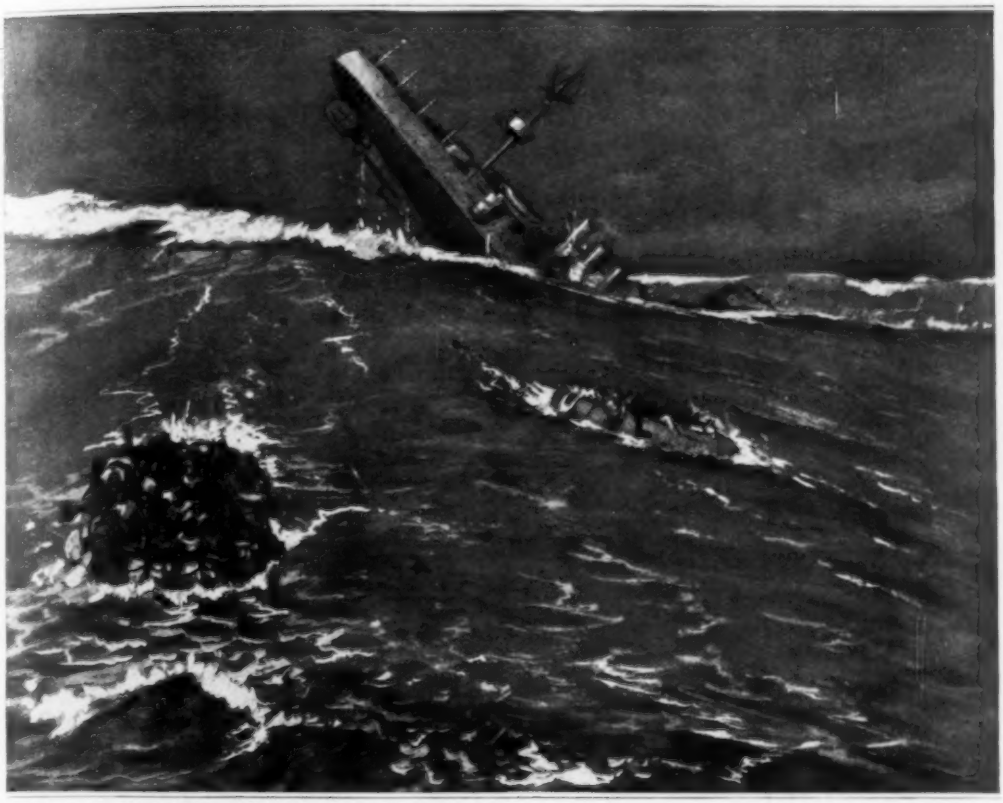
Sinking of the British Battle Cruiser "Hampshire" off the Orkney Islands Early in June with Lord Kitchener of an Hour. Not a Single Lifeboat Cleared the Ship, and Only 12 Men,

and the dark eastern horizon formed a background for the dull-colored German fleet, while the British ships were silhouetted before the sun. Low visibility, periodically caused by mist and rain, worked to the disadvantage of the Britons.

Admiral Beatty's problem was one of holding the advancing German fleet, already in battle formation, until battleship squadrons, spread across the North Sea, could rush to the scene. To do this he had to go into action with cruisers, knowing that they could not stand punishment from formidable dreadnaughts and that some would be sacrificed.

And sacrificed they were, for early in the battle the big but scantily protected "Queen Mary," "Indefatigable," and "Invincible," standing proudly against powerful dreadnaughts, went to the bottom. After about an hour and a half of fighting two enemy submarines were apprehended and destroyers dispatched to frustrate their attack. The latter intercepted a light cruiser and 15 German destroyers, which rushed forward simultaneously. The fast combat that ensued dissipated the intended torpedo raid. This open use of destroyers in the daytime represents a new and significant development in naval warfare. These craft are primarily intended to throw up a screen for capital ships by day, and do their attacking under cover of darkness. In this first big fight, the speedy destroyers broke their bonds and played a continuous and lively part in the day's events. It was during one of their attacks, after the arrival of the British battleship squadron, that the dreadnaught "Marlborough" was hit by a torpedo launched from either a destroyer or submarine. It listed, but remained afloat and in action, fighting



BY THE ILLUSTRATED LONDON NEWS

and His Staff Aboard. The Vessel Struck a Mine in a Heavy Sea and Went to the Bottom within a Quarter Out of More than 150 Who Got Away on Pneumatic Rafts, Survived

as deliberately as if nothing had happened. This shows that the torpedo is not so great a menace to well-armored vessels as has been thought by some.

As darkness set in, the battle positions were constantly changed, the German fleet began to disappear in the hazy mist and by nine o'clock not a ship remained in view. The conflict was not renewed on the following morning, and the British steamed away.

Five days after the North Sea battle, Lord Kitchener, British secretary of state for war, and his staff, en route to Russia on the battle cruiser "Hampshire," were lost off the Orkney Islands. At about 7:30 o'clock in the evening, when a heavy sea was breaking over the deck, the vessel struck a mine, settled by the bow, heeled to starboard, and sank within 15 minutes. Of the 200 or 300 individuals aboard, 12 survived. Attempts to lower the boats met with failure. The captain called to Lord Kitchener to ascend the fore bridge and enter the former's boat. So far as is known, no craft cleared the ship and nothing more was seen of England's foremost military figure. Three life rafts got away, each carrying from 50 to 70 men. All but 12 of the few who did not die of exposure or exhaustion in the five hours of buffeting, were crushed to death when the waves hurled them against the rocks on the rugged coast.

¶Soda fountains are to be installed in the dining and lounging cars of fast through trains on one of the western railways. According to the preliminary plans, soft beverages and other refreshment will be served at all hours of the day and night for the convenience of travelers.

SOME HUMAN PHASES OF WAR GLEANED AT RANDOM

Field Ovens near Royal Barracks on the Quay at Dublin Where Bread is Baked Daily for British Troops Garrisoning the City Following the Irish Uprising

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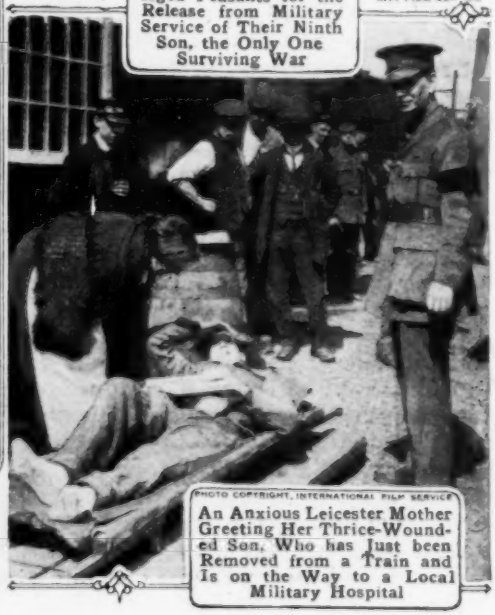
Serbian Premier Listening to the Appeal of Aged Peasants for the Release from Military Service of Their Ninth Son, the Only One Surviving War

This Rugged Mountain Top Is One of the Provision Depots of the Italian Forces in the Alps. The Rock Crevices are Filled with Supplies and Covered by Large Tarpaulins



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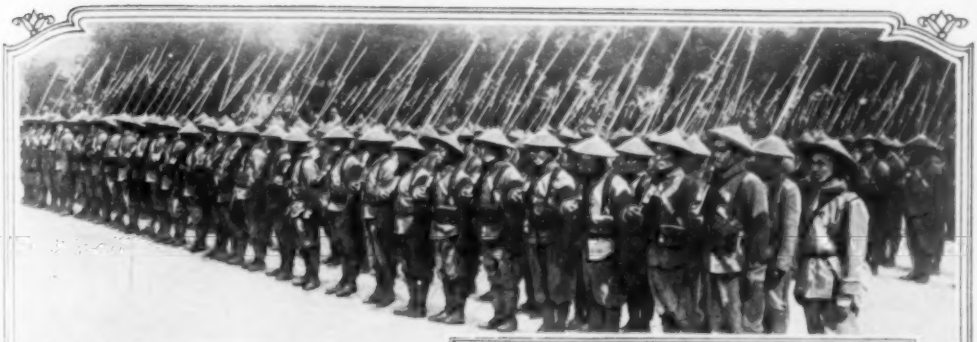
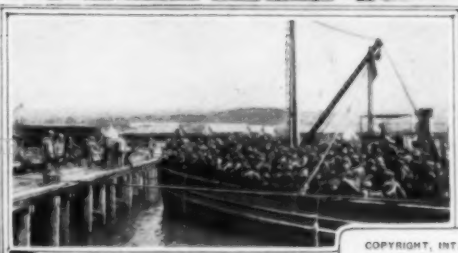
An Anxious Leicester Mother Greeting Her Thrice-Wounded Son, Who has Just been Removed from a Train and Is on the Way to a Local Military Hospital

SOLDIERS OF MANY RACES FIGHT WITH ALLIES



Aside from the Conical, Khaki-Covered Bamboo Hats They Wear, the Equipment of Anamese Troops, Called Out by the French, Is Thoroughly Modern



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Part of Serbian Army, after Reorganization on Island of Corfu, Joining Allies at Saloniki

Algerian Tirailleurs, Large Numbers of Whom are Enrolled with the Allies, Digging In after Making a Bold Advance across Open Field under Heavy Fire

This Picturesque Photograph was Taken within the Court of a Building at Tunis, Used as a Recruiting Station, and Shows Natives Enlisting in the French Army for Continental Service

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FRENCH FIGHTERS IN STIRRING BATTLE

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What It Means When One Reads in the Official Dispatches, "We Occupied an Enemy Crater and Fortified It." This Great Excavation, Made by a Single Shell, Became a French Intrenchment

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Infantry Charge through Partly Cleared Barbed-Wire Entanglement on Hill before Ft. Vaux. Photograph was Taken by Officer Who Issued Order

In the First-Line Trenches of Artois, Showing Grenade Squad Preparing to Hurl High-Explosive Missile with Bomb Thrower

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Large Portable Searchlight, Used for Signaling Purposes in the French Trenches, Held by a Special Harness Fitted over the Shoulders of a Soldier

CHURCH AND FUNERAL SERVICES AT THE FRONT

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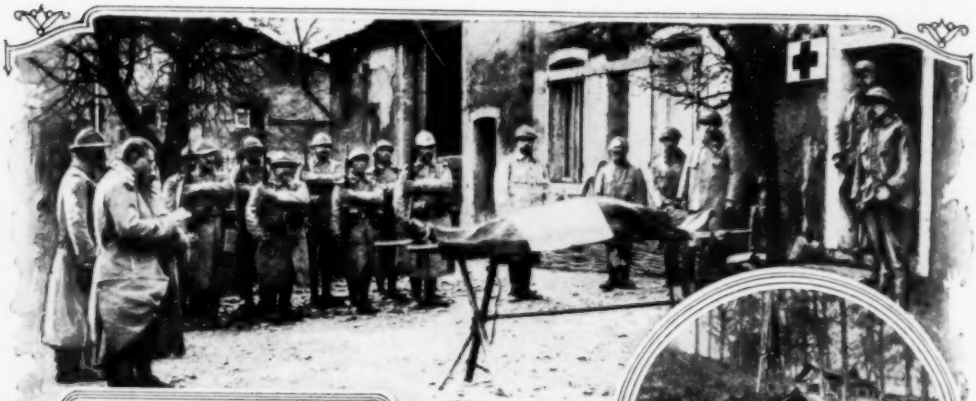
Debris of German Aeroplane on Beach near La Panne. It was Felled Following an Unsuccessful Attempt of Its Crew to Drop Bombs on the Temporary Residence of the Belgian Royal Family

Company of French Infantry Lying Low under Cover of Hillock Awaiting an Order to Advance against the Enemy in the Champagne District

This Photograph was Taken during a Heavy Bombardment of Ft. Vaux Prior to Its Capture by the Germans, and Shows the Destructive Force of Big Shells

Listening Post, Few Yards from German Trenches, Equipped with Motor-Car Horn Which Warns of Approaching Gas Clouds

CHURCH AND FUNERAL SERVICES AT THE FRONT



One of the Commonest Scenes of All Battle Fronts: It Shows One Phase of the Brief Military Funeral

Above, French Soldiers with Heads Bared Entering an Underground Chapel in the Midst of the Argonne Dugouts. The Illustration at the Left Shows the Altar and a Small Part of the Interior

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Bursting in the Background Is a Hand Grenade: The Camera Man Apparently Escaped, but the Soldiers Did Not. Two Men were Killed and One Wounded

"Back of Le Mort Homme," Is All of the Information Sent with This Photograph from Verdun's Battle Lines. The Picture, However, Tells Its Own Story, Which Is: "For God and for Country"

DENTAL SURGERY PRACTICED BY PRIMITIVE AMERICANS

Evidence to support the theory that the aborigines who at one time inhabited southern California practiced dentistry in a crude way, has been brought to light as a result of excavations recently made at Ocean Park by a western archeologist. Many skulls have been exhumed and the teeth preserved in the jaws of some of these form an interesting study. Arches from which molars were extracted before the demise of the individuals have been found, as have also teeth having cavities filled with a composition material consisting of pulverized stone and asphaltum. Rough implements of bone, shell, and stone, some of them bearing a certain resemblance in form to tools used by dental practitioners today, have also been disinterred. We know that the ancient Egyptians, Greeks, and Hindus enjoyed the benefits of dental treatment, but the discovery that some of the earliest inhabitants of this country likewise repaired their ailing teeth is an important revelation. Moreover, it indicates that Josiah Flagg, of revolutionary times, after all was not the first American dentist. Some of the implements uncovered on the coast are said to be almost identical in appearance to some excavated at Mycenæ, Greece, and estimated to be 2,500 years old.

The Crude Dental Tools at the Top were Recovered from This and Other Excavations at Ocean Park. The Molar Missing from the Arch at the Right was Apparently Extracted Artificially before Owner's Demise

CONCRETE BRIDGE OF UNUSUAL DESIGN

A bridge which has been built over a drainage canal in Kansas is unusual in that, while it is made entirely of concrete, it is of the overhead-arch type. It was the desire of the builder to use concrete because of its permanency, and at the same time he wished to construct a bridge which would obstruct as little as possible the flood waters that occasionally fill the canal. He estimated that the overhead-arch type would provide a span that would accommodate 20 per cent more water than the ordinary arched bridge. This structure is 40 ft. long and 12 ft. high.

A Concrete Bridge Built with Overhead Arches to Allow More Headway for Flood Waters than Ordinary Arch

"MANICURING" A CAPTIVE LEOPARD'S CLAWS

The task of trimming the claws of a wild beast in a "zoo" is a rather strenuous one, as is shown by the manner in which "Dick," the seven-year-old leopard in Central Park, New York, is treated when his claws are cut short. At a recent "manicuring" the animal was thrown on his side close to the front of his cage so that one front leg and one hind leg projected under the frame supporting the iron bars. The two legs were then drawn out their full length by ropes fastened just above the paws and tied to an outer railing, making it impossible for the animal to move. In this position the keepers were able, with scissors and other instruments, to undertake in safety the trimming so essential to the leopard's comfort.

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How the Claws of "Dick," the Seven-Year-Old Leopard in Central Park, New York, are Trimmed

WAR DEPARTMENT TO ADOPT NEW SHOE FOR SOLDIERS

Our expedition into Mexico has conclusively proved that the shoe now used by the American soldier, and pronounced by medical authorities to be one of the most nearly perfect models ever designed, is entirely unfit for the rigors of campaigning. As a result the quartermaster corps has developed a new shoe which retains the lines of the old, but embodies the good features of those worn by French and Belgian fighters. Several hundred pairs are now being tried out on the Mexican border, and if they prove satisfactory, will undoubtedly be adopted for field service. This will mean that the army will return to its former practice of issuing two types of shoes to soldiers, and that the present one will be retained for garrison wear. The shoes worn by our soldiers at present are lined and this has been the cause of their failure. On long marches, and especially after becoming wet, the lining wears through quickly with the result that bruised, sore feet have menaced Pershing's forces ever since they crossed into the sandy wastes to the south. The new shoe is unlined, of the blucher type, and has the smooth surface of the leather on the inside next the foot. The quarter extends to the sole, while the stiff counter is on the outside, as is the foxing. This construction is opposite to that of the ordinary boot. The sole is of double thickness and has 54 round-headed hobnails, while the heel has 15 of these in addition to a horseshoe-shaped steel plate. Since the unfinished, or flesh side, of the leather is turned out, the shoe is about the color of buckskin and is of clumsy, rough appearance, but undoubtedly more comfortable than its better-looking predecessor.

These Three Photographs Show in Detail the Type and the General Form of Construction of the Field Shoe Which the War Department will Probably Adopt for Our Troops

Grown Men Seem to Find as Much Fun in Riding These Balky Little Hobbyhorses as Do Their Young Sons

WOODEN HORSE THAT WALKS TOY FOR YOUNG AND OLD

One of the most novel and ingenious amusement devices developed in recent years for summer parks and other resorts is a hobbyhorse that actually walks. It is not intended merely for youngsters since pleasure-bent tourists and week-end vacationists, who are desirous of rejuvenating themselves for a day or night, find it as screamingly funny as do their children. The contrivance consists of a sturdily built, well-finished wooden horse so arranged that its fore and hind legs can be alternately moved by pulling and pushing upon an operating handle mounted in front of the rider. The limbs are jointed at the hips and knees, and by means of a simple mechanical arrangement are made to bend when the lever is actuated. The horse rears and pitches, its head swings back and forth, and the rider bobs slowly along without necessarily overexercising himself. Obviously the appearance of a large man or woman on one of the horses, which somewhat resemble those used on a merry-go-round, is extremely ludicrous. They may be ridden about park grounds, raced on a small track, or walked up and down the deck of a ship.

BLOWERS DRY TELEPHONE WORKMEN'S HANDS

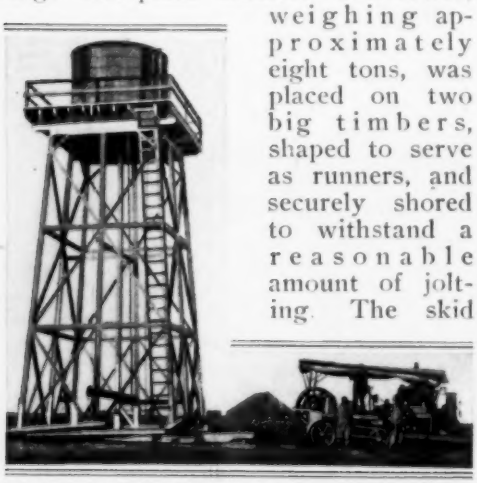
Small electric blowers have been employed for an unusual purpose in a southern city in connection with the making of splices in underground tele-

Electric Blower and Air Tube Employed to Keep Dry the Hands of Splicers Working on Telephone Cables in Hot Manholes

phone cables. Much of the splicing had previously proven unsatisfactory, and it was found that perspiration from the hands of the cable men, working underground in very hot weather, so moistened the paper sleeves which insulate the fine copper wires in the cables that short-circuiting resulted. Blowers were secured and each fitted with a collapsible tube of black canvas, 6 in. in diameter and 15 ft. long. The fan was set just outside the manhole and with it a strong current of air was forced upon the splicer's hands and forearms, keeping them dry and ventilating the underground chamber, thereby driving out any gas that may have collected. Current to operate the blower was secured from any near-by wire.

TALL WATER TOWER MOVED BY TRACTION ENGINE

When it became necessary on a western farm, a short time ago, to change the position of a 50-ft. water tower to a location a half mile distant, it was decided to move the structure intact. Although the intervening ground was rough and cut by two small sloughs, the work was accomplished successfully with the aid of a large caterpillar tractor. The tower, weighing approximately eight tons, was placed on two big timbers, shaped to serve as runners, and securely shored to withstand a reasonable amount of jolting. The skid was connected to the tractor by a heavy cable and the tall structure moved with dispatch without a single mishap. The expense was much less than would have been incurred had it proved necessary to tear down the tower and rebuild it at the new site. The fact that the structure has a broad base, which tends to offset its height, is largely responsible for the ease with which the work was accomplished.



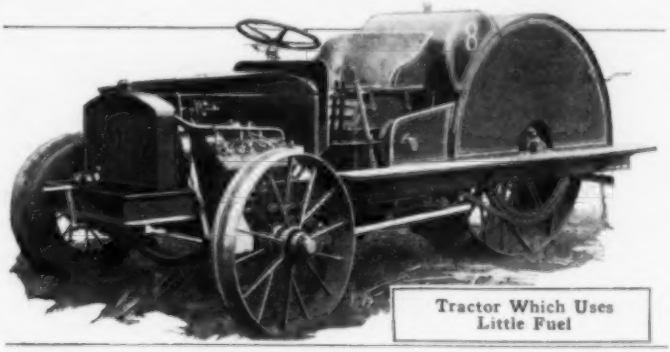
The Structure was Placed on Runners and Moved over Rough Ground a Distance of a Half Mile without a Single Mishap

TO SELL SOUTHERN BIRCH BARK FOR BIRCH OIL

An increase in the price of a certain synthetic oil which is often used instead of wintergreen oil or sweet-birch oil, has improved the market for birch bark. This is believed to have prompted an application, made recently, to buy all the black-birch bark on a large watershed in one of the national forests in the southern Appalachians. It is said that the bark will be used by the inhabitants of the region in distilling birch oil, which is used for medicinal purposes. The rather crude equipment employed by the mountaineers in producing the distilled product resembles the stills used in making "blockade" whisky. The bark is peeled off the trees and then its rough surface removed, after which it is broken into bits and put into a still with enough water to cook it. A fire is started and the steam is led through a pipe and finally condensed. The heavy oil gathers in a receptacle while the water runs off. About 22 bushels of bark are used for every run, which amount produces about four pounds of oil. Three or four runs can be made in a week. The forests in the East purchased by the government contain large numbers of birch trees which are not altogether desirable in southern mountains because more valuable timber might be grown on the land that they occupy. However, in such agreements as will be entered into regarding the sale of birch bark, provision will be made by the government officials for the preservation of enough trees to insure an adequate stand of birch timber in the future.

EIGHT-CYLINDER TRACTOR FOR FARM WORK

A gasoline tractor with an 8-cyl. engine has been built by a Minneapolis firm for farm purposes. In recent plowing tests it has made a good record both as to speed and fuel consumption. The engine develops a drawbar pull of 32 hp. on the three-mile gear ratio, and a belt power of 50 hp. It is equipped with cut-steel gears, roller bearings, a high-tension ignition system, and a double-chain drive, and has only two gear reductions. In plowing an 80-acre field of wet gumbo it pulled six 14-in. plows at a depth of 6 in., the engine running on high speed all the time and making an average of four miles per hour; 120 gal. of gasoline were consumed, or 1½ gal. per acre. Three gallons of cylinder oil were used. It is claimed that this tractor has been able to work in fields too wet for ordinary tractors.



Tractor Which Uses Little Fuel

PARK TRAFFIC IS DIRECTED BY WORDLESS SIGNS

Unlettered road signs are being used to regulate motor-car traffic on the driveways of a Fargo, N. D., park. Although they do not give a motorist a single word of instruction or warning, they have served their purposes efficiently. At best, road signs detract more or less from the appearance of a parkway or boulevard, especially when they are literally signboards. While those used in Fargo are only a small improvement in this respect, they hold a good suggestion. One of these signs was recently erected to direct traffic into a new artery branching from an old and much-traveled one. It consists of a white post, at the top of which are two arms, the right one pointing in the direction to be pursued, while the other hangs down. Although this means a reversal of the accustomed direction of travel, from the beginning motorists turned into the new road without hesitation. At a sharp turn, in order to cause ve-

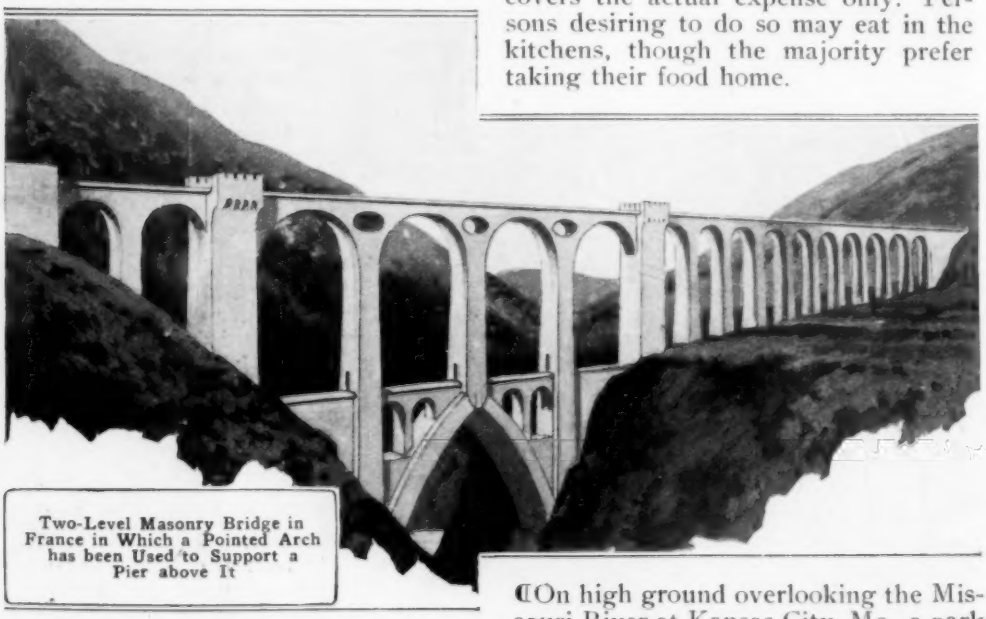
Upon Approaching This Semaphore Motorists Instinctively Slow Down

This Sign has been Used to Direct Traffic into a New Driveway Which Reverses the Accustomed Direction of Travel

hicles to slow down upon approaching this point, a similar sign has been installed. The arms of this one both extend outwardly, much the same as do a brakeman's arms when he is signaling a locomotive engineer to proceed slowly.

TWO-LEVEL MASONRY BRIDGE HAS UNUSUAL FEATURES

A very artistic two-level bridge and viaduct of masonry, having distinctive architectural features and bearing a resemblance to old Roman viaducts, has recently been built for an electric railway over the Tet River in southern France. An unusual feature of the bridge is that one of its five piers rests on the keystone of a single-pointed arch that springs from either side of the ravine in which the river flows. All the other arches are of the round type. A walkway, level with the top of the pointed arch, extends through the piers which rest on or adjoin that arch. The bridge is approximately 300 feet long; the approach on one side has two arches and on the other, 10 arches. The total length of the structure is 780 ft.



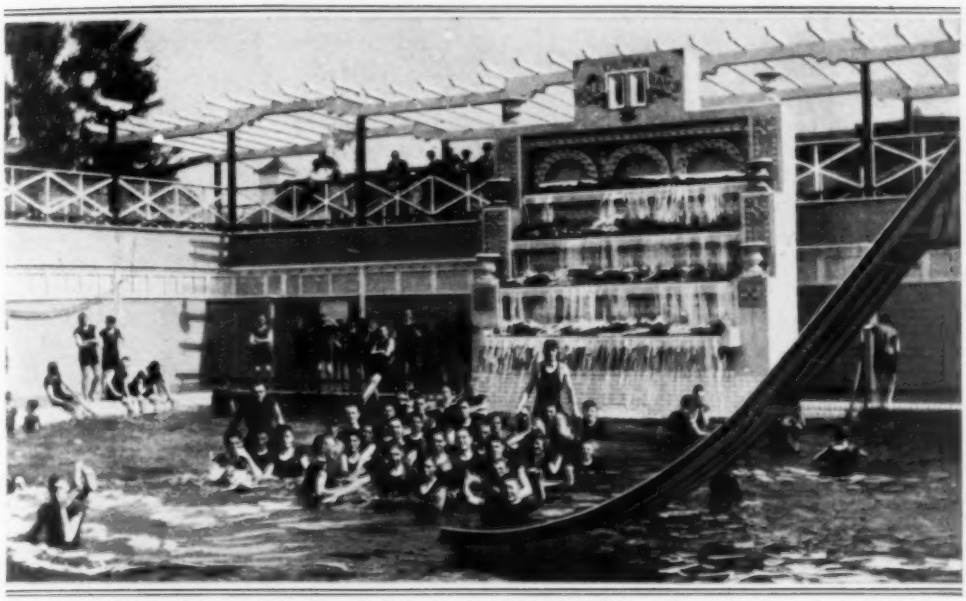
Two-Level Masonry Bridge in France in Which a Pointed Arch has been Used to Support a Pier above It

and the height of the roadway above the stream is nearly 225 feet.

HOW GERMANY MANAGES HER FOOD KITCHENS

The way Berlin manages its food kitchens, which were opened recently, is another illustration of the methods of practical economy which characterize Germany's success in meeting the emergencies of the war. At the outset food was served in but one ward, but plans were made to establish enough of these food stations in the various wards to feed 250,000, should conditions warrant. The food, which consists of meat and vegetable stew and groats, is cooked in a central station and then carried in asbestos-covered cans by automobile to various distributing centers. Prospective patrons of the kitchens must put in their applications a week in advance and surrender seven-tenths of their meat cards and two-thirds of their potato cards, for which each receives in exchange a card containing seven coupons. On presenting one coupon and the equivalent of nine cents, the applicant receives a check which entitles him to about a quart of food. The money charge covers the actual expense only. Persons desiring to do so may eat in the kitchens, though the majority prefer taking their food home.

¶On high ground overlooking the Missouri River at Kansas City, Mo., a park for the exclusive use of women is to be established.



After the Water has been Filtered and Subjected to the Germ-Killing Ultraviolet Rays, It is Aerated by Falling in a Cascade to the Pool

VIOLET RAYS PURIFY WATER USED IN BATHING POOL

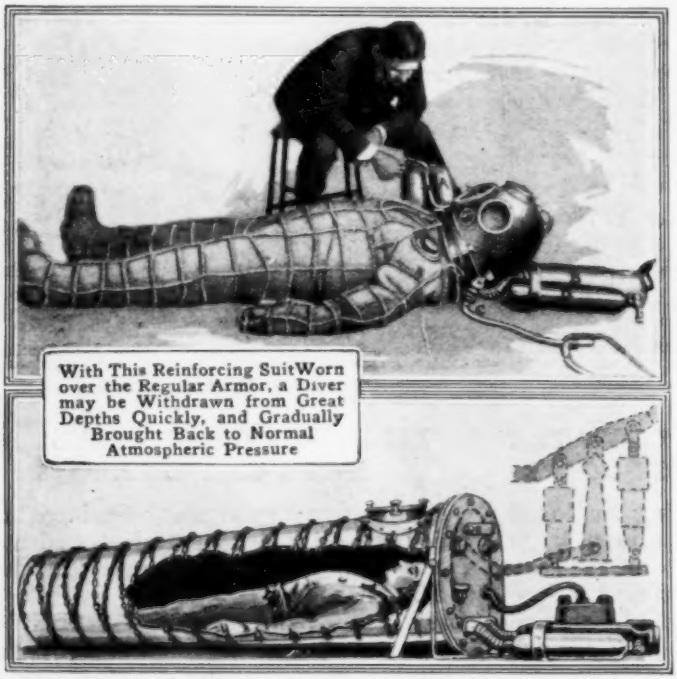
Ultraviolet rays are being employed to purify the water used in a large natatorium at a St. Louis amusement park. The water is taken from the deepest part of the pool, passed through a series of filters that remove the suspended matter, and then subjected to the bactericidal influence of the light. Theoretically at least, all germ life is destroyed by this process. As the water passes the source of illumination it falls in a cascade, so that it is thoroughly aerated before reaching the tank below. The swimming pool contains some 400,000 gal. of water, which is continually being withdrawn from one end, cleansed, and returned at the other extremity. It is not understood that this obviates the necessity of periodically emptying and washing the basin, but that it tends to keep the water in a reasonably sanitary condition without requiring the constant introduction of fresh water from the city mains. The equipment consists essentially of a centrifugal pump, a motor generator, a battery of filters, and the lighting set.

EMERGENCY RAINCOATS MADE OF PAPER

Inexpensive emergency raincoats which can be folded up and carried in a pocket or handbag, are being made to fill the need so sorely felt when one is caught in a storm without any form of waterproof protection. These garments are made in sizes suitable for men, women, and children, and come in two grades. The cheaper article is made of tough paper only, coated on one side, and is designed to be used but once; the other is reinforced with cloth mesh, and with proper care can be worn several times. Since it affords excellent protection against wind, rain, and cold it is especially suited for automobilists.

NEW APPARATUS SAFEGUARDS DEEP-SEA DIVERS

To enable the quick removal of divers from the water and facilitate their treatment when they show symptoms of distress after removing their armor, two interesting devices have been developed in Germany, where they are coming into extensive use. One consists of a suit, made of cloth-covered chain, that fits over the usual diving dress, reinforcing it and allowing the air pressure within to be raised to any desired extent. When this is worn, the usual practice of raising a diver to the surface by slow degrees, so that his body may accustom itself to the decreasing pressure of the water and lastly the light pressure of the atmosphere, is obviated. He remains under heavy air pressure—instead of water pressure—while being pulled directly to the surface. The air is then gradually released from the suit. This has precisely the same effect as if he were held at different depths in the water for a similar length of time. The advantages come in that the man is not subjected to prolonged exposure in cold water; may, if necessary, be given medical attention, and is not imperiled in case a heavy storm makes his immediate withdrawal imperative.

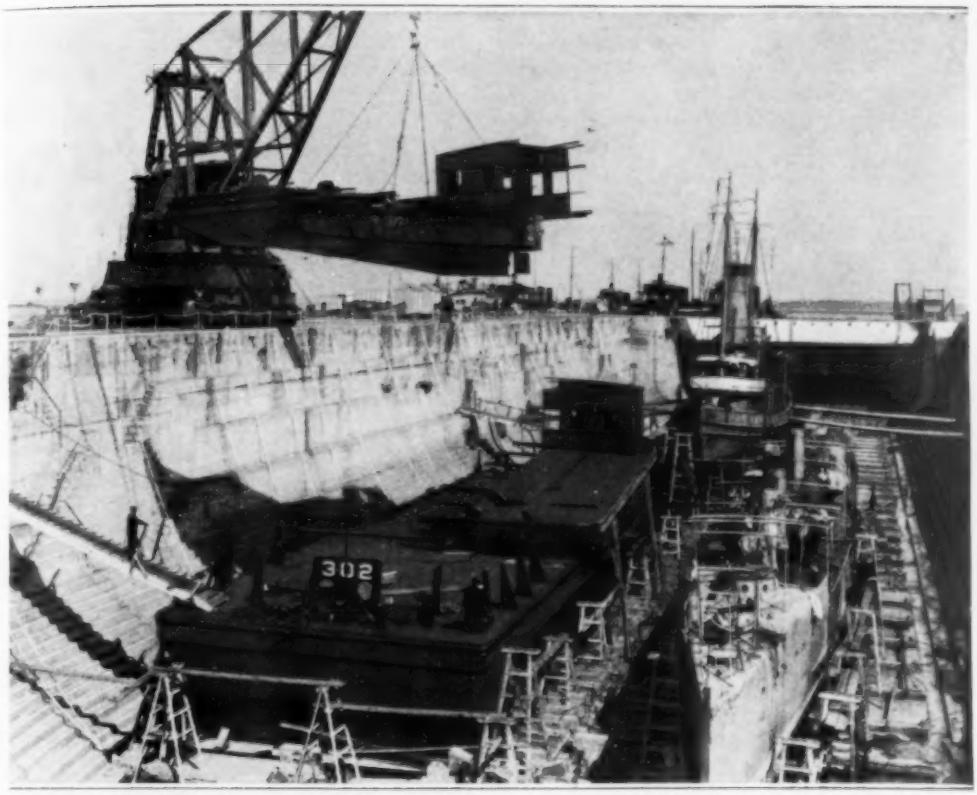


With This Reinforcing Suit Worn over the Regular Armor, a Diver may be Withdrawn from Great Depths Quickly, and Gradually Brought Back to Normal Atmospheric Pressure

This Shows the Decompression Sack in Service. When Not Inflated It Occupies Little Space and is More Easily Transported than the Usual Steel Chamber

The other apparatus is a collapsible decompression sack which is intended as a substitute for the rather cumbersome steel chamber generally used. It is made of rubber fabric and strengthened with a meshwork of chains so that it may be inflated to a high pressure. When filled with air it is of cylindrical shape. One end is provided with a plate that may be removed to permit the entrance of a patient, who lies down within it. The top side at the head is also fitted with a glass-covered port. This contrivance is employed when an operator, after removing his armor, shows symptoms of "bends," or suffers in some other way from the effects of his dive. He is placed in it and subjected to heavy pressure which is very gradually lessened, after a period, by means of valves. A diver's distress is usually due to the fact that excess nitrogen, taken in during the period under water, has not had time to work itself out through circulation and respiration and has formed bubbles in the veins and internal organs which may cause serious consequences. In such cases the decompression chamber, or sack, is required for his treatment.

¶Pith of sunflower stalks is said to be the lightest of vegetable substances. It is 10 times lighter than cork and is used extensively in Russia in making life-saving appliances.



Pontoon Section of Marine Derrick for Salvaging Flying Boats being Loaded on a Barge in Dry Dock at Charleston Navy Yard

MARINE DERRICK RECOVERS SWAMPED FLYING BOATS

For use at the Pensacola, Fla., aeronautical station of the navy, a large self-propelled derrick has been put together which will be employed in salvaging flying boats that fall into the ocean. It was recently completed at the Charleston navy yard and shipped to Florida to be assembled. In general, it is designed in the form of two pontoons, connected by trusses and decking, on which a derrick with a five-ton capacity and hoisting speed of 5 ft. a minute, is installed. Two gasoline engines drive generating units that supply current to the motors turning the screw propellers and operating the crane. It is not infrequent that flying boats are swamped when novices are being given instruction, and in such instances they are invariably damaged when attempts are made to tow them ashore, even though the utmost care be exercised in doing it. With the floating derrick it will be possible to lift foundered craft out of the water and return them to the station, or to a battleship, without injuring them.

STREET TRAFFIC REGULATED BY ELECTRIC SEMAPHORES

Vehicle traffic on Market Street in San Francisco is being regulated at several intersections by means of electric signaling devices operated by policemen stationed at the curbs. Illuminated signs bearing the word "Stop" are suspended in plain view above the crossings. Each is controlled by switches installed in a box mounted on an adjacent lamp-post and arranged to make a half revolution when cur-

rent energizes its operating magnets. A policeman, by pressing a button, causes a whistle to be blown and the sign turned to stop east and west traffic, for instance, and open that in the

By Pressing a Button the Officer Turns Signal and Operates a Shrill Whistle, Causing Traffic Traveling in One Direction to Stop and Cross Traffic to Start

cross direction. At the end of business hours, when an officer goes off duty, he closes a switch which allows a pair of leaves to drop over the sign, covering it so that it will not confuse drivers during his absence.

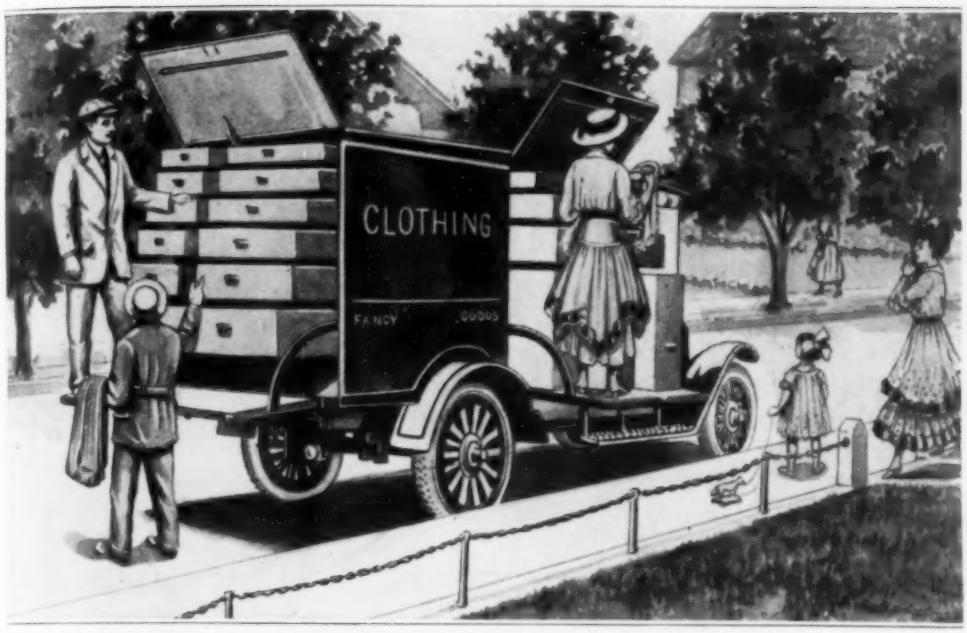
ANIMALS KILLED HUMANELY WITH ILLUMINATING GAS

Illuminating gas is now used in the pound of the city of Denver to kill dogs and horses, because it is believed that this is the most humane way to take an animal's life. The Denver method, it is said, gives the condemned beast no terrorizing premonition of his fate and causes no suffering or discomfort. That city's equipment, including small air-tight chambers in which dogs are asphyxiated, represents an expenditure of $500, though in most instances much simpler arrangements would suffice. For disposing of old or injured horses a simple inhaler has been devised which fits tightly over the animal's nose and somewhat resembles a feed bag. A rubber hose attaches to the lower end of the inhaler and at the proper moment the gas is turned on. The horse becomes drowsy, lies down, and expires quietly within four minutes; a state of complete insensibility is reached in a little over two minutes. About 10 cents' worth of gas is required to kill a horse. Denver's poundmaster loans the inhaler, which he has devised, to any person in the city whose condemned horse can be brought sufficiently near a supply of gas.

TRUCK WITH SPECIAL BODY IS A STORE ON WHEELS

An enterprising clothing dealer in Bangor, Me., may well be regarded as the modern successor to the once familiar itinerant merchant who frequented rural districts, for this man has what is virtually a store on wheels. He has a motor truck equipped with a body having 22 drawers of various sizes in which clothing, furnishings, etc., can be packed. Some of these drawers are deep enough to allow their contents to hang full length. Each is mounted on rollers. Doors, which close in front of the drawers, fasten with a Yale lock. The truck tours

On the Left Is a Horse About to be Asphyxiated, the Gas being Administered through an Inhaler. In the Middle View, Taken 50 Seconds Later, the Horse Has Lain Down and Is Almost Unconscious. Death Came Painlessly within Four Minutes, as Shown in the Right-Hand View



Special Motor Truck in Which a Bangor, Maine, Merchant Carries a Large Stock of Clothing and Fancy Goods through the Country

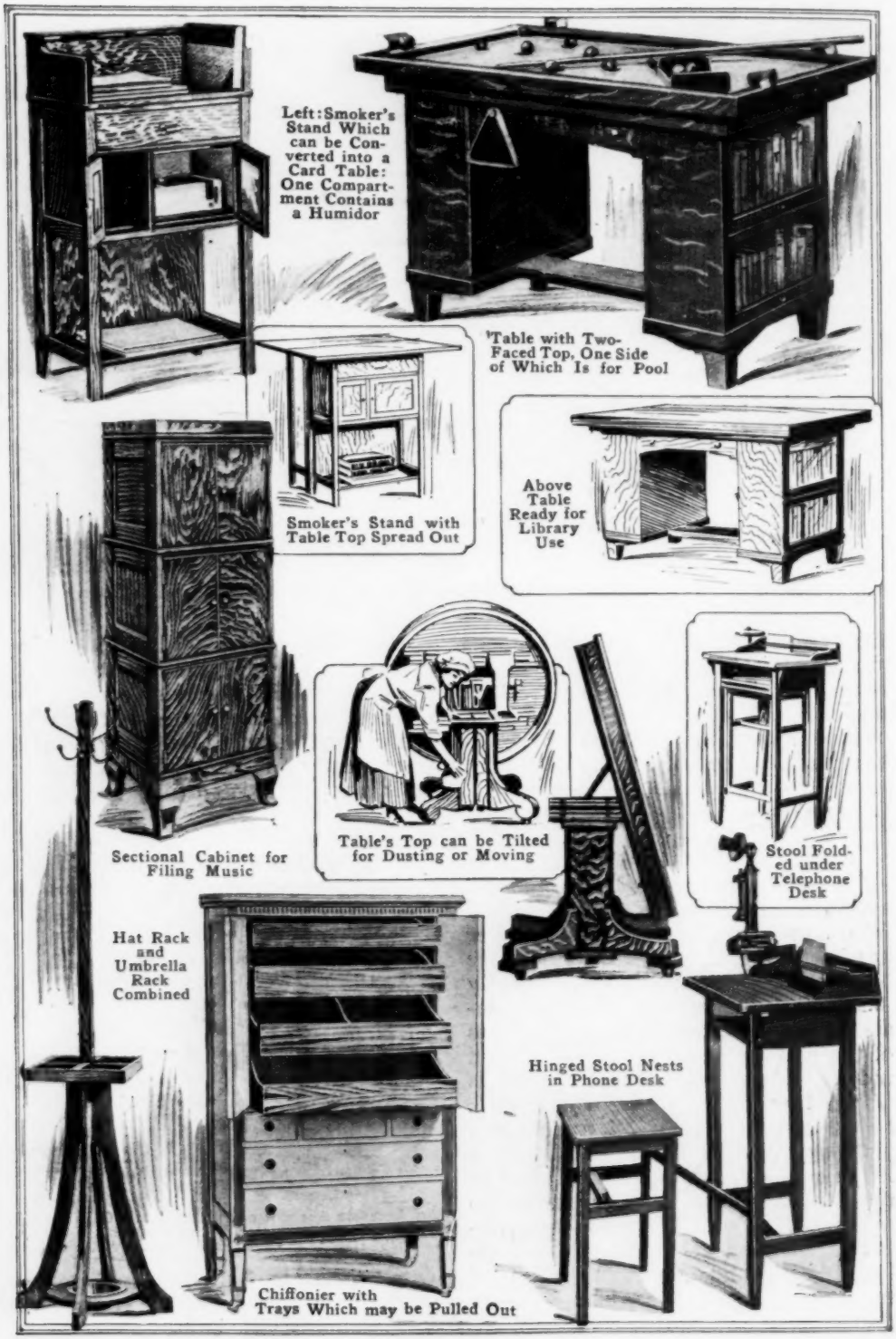
the region around Bangor, and goods are displayed wherever there is a chance of a sale. The lower doors at the end and side of the truck, when opened, serve as a platform on which one can stand to inspect the stock.

PHONE METER KEEPS RECORD OF OUTGOING CALLS

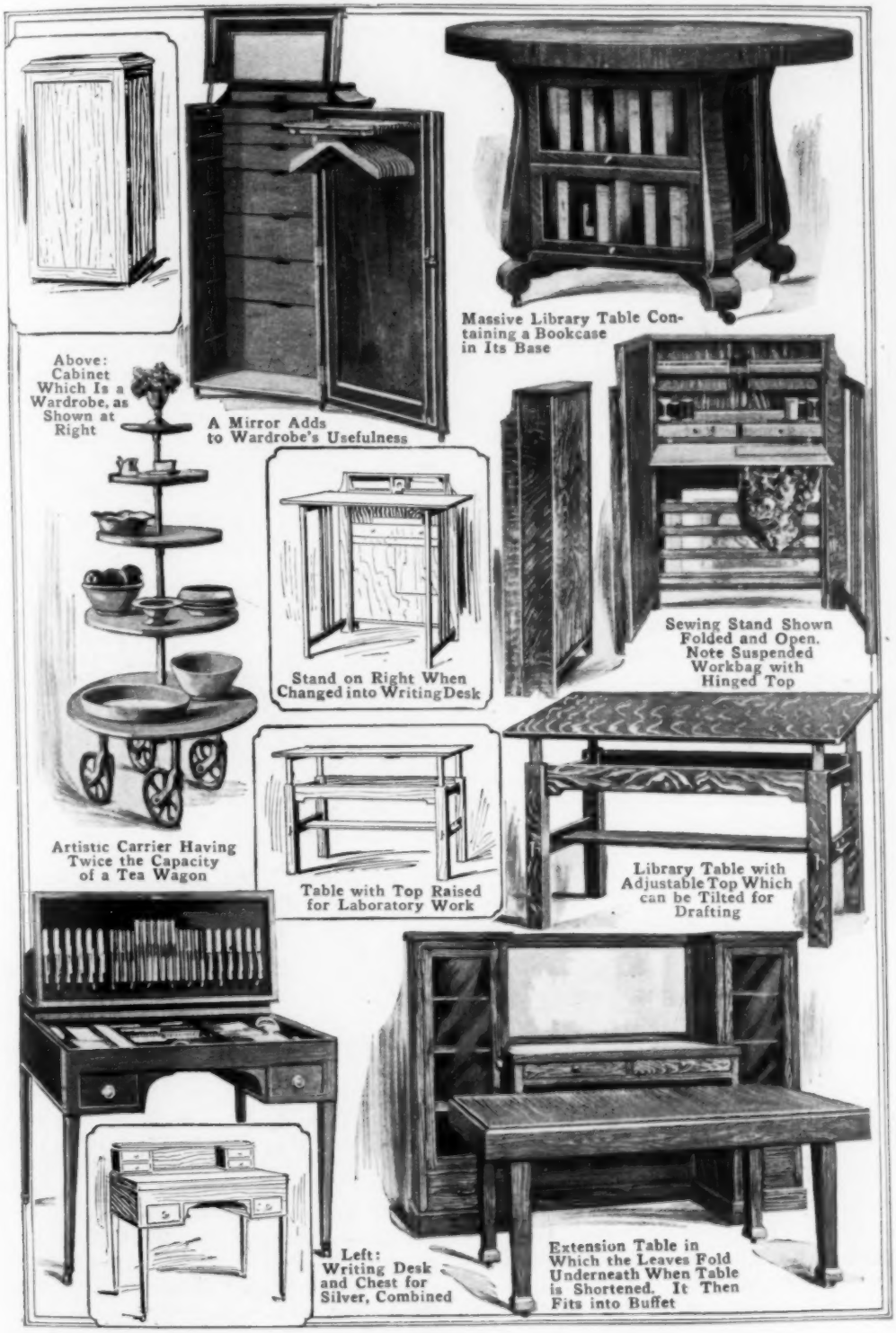
To assist a subscriber in keeping an accurate record of his outgoing calls from month to month, a simple meter has been devised for measured-service telephones. The appliance is purely mechanical in its operation and designed to be attached to instruments of the desk type. A spring-controlled rod, extending from the meter which is clamped at the top of the standard, slides outwardly and locks when one picks up the receiver. In this position it prevents the return of the latter to the hook unless a button is pressed to release it. For this purpose two buttons are provided. Both of these unlock the rod and permit the return of the receiver, but one of them prevents the meter from registering. Thus when a party fails to respond, or an incoming message is received, the counter, which has a visible dial, remains neutral. The chief value of the device is to enable the user of measured service to check intelligently his monthly statements. It is also of assistance to the person who wishes to limit his calls to the minimum prescribed by his contract so as to avoid paying extra charges.

An Accurate Account of a Subscriber's Calls is Made by This Telephone Meter, Which Enables a Measured-Service User to Check His Monthly Statements

UNUSUAL PIECES OF CONVERTIBLE FURNITURE


Left: Smoker's Stand Which can be Converted into a Card Table: One Compartment Contains a Humidor
Table with Two-Faced Top, One Side of Which Is for Pool
Smoker's Stand with Table Top Spread Out
Above Table Ready for Library Use
Sectional Cabinet for Filing Music
Table's Top can be Tilted for Dusting or Moving
Stool Folded under Telephone Desk
Hat Rack and Umbrella Rack Combined
Hinged Stool Nests in Phone Desk
Chiffonier with Trays Which may be Pulled Out

THAT LESSEN HOUSEWORK AND SAVE SPACE


Above: Cabinet Which Is a Wardrobe, as Shown at Right
A Mirror Adds to Wardrobe's Usefulness
Massive Library Table Containing a Bookcase in Its Base
Sewing Stand Shown Folded and Open. Note Suspended Workbag with Hinged Top
Stand on Right When Changed into Writing Desk
Artistic Carrier Having Twice the Capacity of a Tea Wagon
Table with Top Raised for Laboratory Work
Library Table with Adjustable Top Which can be Tilted for Drafting
Left: Writing Desk and Chest for Silver, Combined
Extension Table in Which the Leaves Fold Underneath When Table is Shortened. It Then Fits into Buffet

CONCRETE TANK SUPPORTED BY SLENDER STEM

A reinforced-concrete water tower of unusual design is now in use in Bay Minnette, Ala. The structure stands 80 ft. high; a cylindrical concrete tank of 45,000-gal. capacity is supported by a slender stem made by surrounding the vertical feed pipe with walls of concrete; these walls are thicker at the base than at the top, giving the stem a graceful tapered shape. The walls of the tank are only 6 in. thick. A commercial waterproofing was used in such proportion as to make a dense mixture so that no other waterproofing was necessary. When the tank was first filled there was some seepage but this stopped within six weeks. A ladder leads from the ground to the roof of the reservoir. The cost of this structure was slightly less than the cost of a steel tank would have been.

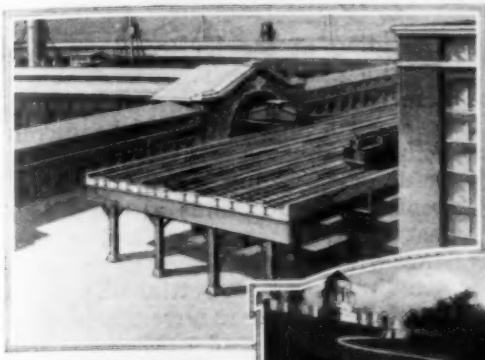
SELF-OPERATING CONTROL FOR AUTO HEADLIGHTS

An automatic short-circuiting device now on the market is designed to be installed between the lighting switch and the headlights of a low-priced automobile so that at low speed the machine may have one bright headlight instead of two dim ones. All recent cars of this make receive lighting current from the same low-tension magneto that supplies current for ignition, and its strength varies with the engine's speed. This attachment consists of two springs in contact with one another, together with certain wires, all parts being contained in a narrow case; a wire connects its middle post with the cross wire between the lights. When the engine is running under 15 miles per hour the current is shunted through two springs, a platinum-iridium contact, and into one headlight only, producing several times the light that the same current would in two bulbs. At 15 miles or more the engine generates a current of such strength that when it passes through a small wire in the device the wire expands and breaks a contact, allowing the current to supply both headlights.

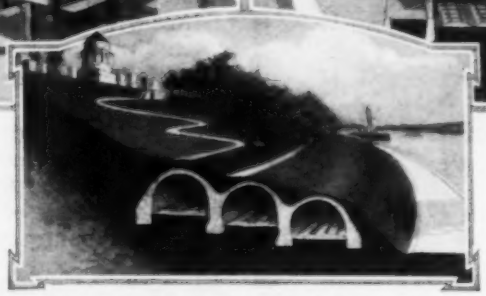
POTTED KALE PLANT SHELTERS NESTS

The semitropical climate of Long Beach, Calif., and the patience and skill of a police officer in that town have combined to produce a California kale plant that has grown to a height of 7 ft. 2 in. within a period of 10 months. Much of the woody stalk has been stripped of its leaves, leaving a rounded mass of foliage at the top, so that the plant looks like perennial shrubbery. Two linnet's nests, in each of which there are eggs, are hidden among the leaves. The plant is set in a wooden tub and partly supported by cords which extend from near the upper end of its stalk to the rim of the tub.

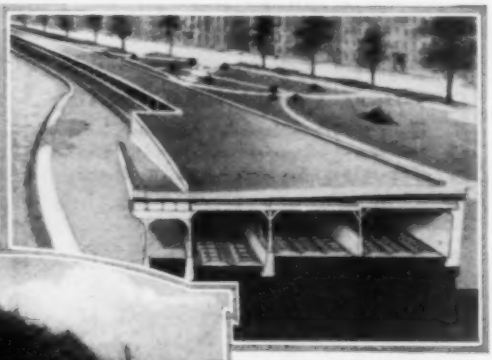
GOTHAM PLANS TO RECLAIM HUDSON RIVER FRONT



Elevated Tracks would Connect with the New Piers Proposed to be Constructed between 42d and 50th Streets



At Grant's Tomb in Riverside Park, Illustrating How the Tracks would be Carried Underground and the Park Extended to the Water



In Upper Residence Section the Tracks would be Covered and a Ramp Provided Leading to Motorboat Basin

New York has always led in the reclamation of railroad rights of way by causing transportation companies to depress and cover their tracks. It has lately formulated a new plan for dealing with the New York Central line which extends down the west shore of Manhattan Island, marring the park and residence sections along Hudson River. If carried out, this latest scheme will eliminate the present street-grade tracks which for years have exacted a toll in lives, allow Riverside Park to be extended to the water's edge, and permit the conversion of Inwood Hill, beneath which the tracks would pass in tunnels, into a public recreation ground. The project is one of track covering and track elevation, the main cost of which would be met by the transportation company. Property valued at approximately $5,000,000 would be transferred to the city, while the latter would in turn present to the railroad about $11,000,000 of real estate in the form of subsurface easements, permission to erect elevated structures across certain streets, and similar grants and concessions chiefly of value to the company. Through park and residential districts the tracks would be placed underground, while in business sections they would be carried above grade. By this arrangement a parkway would be provided almost continuously from 72d Street to Spuyten Duyvil. A freight yard would be established between 133d Street and 151st Street, while at 59th Street the tracks would be led from the tunnels onto an elevation and carried to a new terminal to be built at Canal Street. Between 42d Street and 50th Street the tracks would connect at the upper level with new piers which are proposed to be constructed.

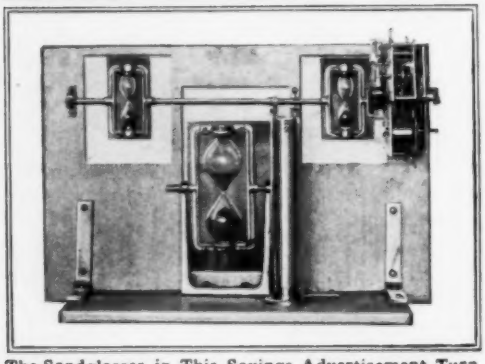
SANDGLASSES VISUALIZE LESSON IN SAVING

A mechanically operated window display was employed with much success recently by a Chicago banking house to advertise its savings department. It consisted of three sandglasses set in apertures cut in a large placard on which was this legend: "Watch Time Make Money. Every three hours one cent in interest is paid for every $1,000 deposited in our Savings Dept."

Each of the glasses, one of which was 10 times as large as the other two, was set in a metal frame which was axially mounted; all three were connected with clockwork hidden

behind the placard. The clockwork was so adjusted that the two small glasses were inverted every three min-

Watch Time Make Money
Every three hours one cent in interest is paid for every $1000 deposited in our Savings Depi.
Small sand glasses turn over every three minutes. Large glass turns over every thirty minutes
Savings
Department



The Sandglasses in This Savings Advertisement Turn Over Just as the Sand in Them Finishes Running through Their Necks. Below: The Rear of the Display, Showing the Concealed Clockwork Which, Assisted by a Weight, Turns the Glasses at the Proper Times

utes, which was just the time required for the sand to run through their necks; their frames were connected by gearing with the large glass in such a ratio that the large glass turned over every 30 minutes. A weight suspended from a cord, which periodically was wound up on a drum, supplied the power to operate the mechanism when the cogwheels were tripped by the clockwork.

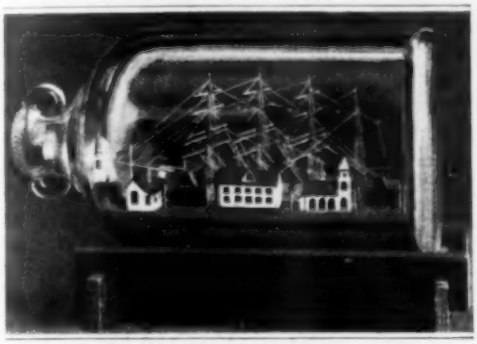
BOTTLE HOLDS MODEL SHIP AND MINIATURE PORT

Residing at the United States Marine Hospital, Port Townsend, Wash., there is a crippled sailor who devotes most of his time to an odd handicraft. With two thumbs, the only remaining useful parts of his hands, and a few simple tools, he builds a model four-mast bark, a tiny tug, and a miniature village, and places them within a small-necked 7-in. bottle. He is able to make one of these novelties in about a month's time, and during the past two years has been able to dispose of all that he has finished. The interesting part of the work is the manner in which the large vessel is placed in the flask after being carved out of wood.

The first step is to provide an "ocean." This is done by coloring a quantity of putty with green and blue paints and then molding it into pencil-like rolls which are laid parallel with one another within the bottle. A narrow flat stick enables this to be done without soiling the glass, while a special paddle is used to level the surface so that a hook-shaped, flattened wire, deftly used, produces the "waves." On one side of the "water" is built a "shore," a similar process being followed, and the model houses and trees comprising the mimic village are set in place.

The hull of the ship is carved from one piece of wood, but such things as the cabins, lifeboats, stairs, wheel, capstan, and other appurtenances, are made separately and glued down. A large number of holes are bored in the hull, masts, and yards with a drill, and tiny reels placed on the forecastle and poop, to accommodate the rigging, which consists of silk thread. A joint is made in each of the masts about 1/16 in. above the deck, and since the braces, backstays, and shrouds all lead toward the stern, it is possible to lay the masts down in that direction. When this is done there is enough slack to permit the yards to be tipped on one side and placed flat on deck with the masts.

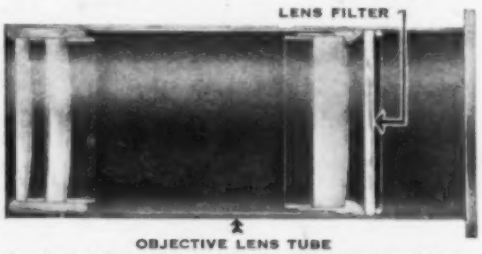
When completely rigged and everything laid low to permit its passage through the neck, the boat is slipped inside of the bottle and pressed firmly into the putty. As the stays, which are passed through the holes in the masts, the deck, and the jib boom, are pulled, the rigging is raised, the masts drawn erect, the yards brought to their right positions, and the shrouds, backstays, and braces made taut. The holes in the jib boom, through which the stays pass, are then sealed and the loose ends of the latter clipped off. The deck houses are laid in and glued in place, while the tug, which is small enough to pass through the neck completely assembled, is slipped in with a wire or stick. The bottle is then sealed.



The Odd Handiwork of a Sailor: A Four-Mast Bark, a Tug, and a Mimic Village within a Bottle

PICTURE-MACHINE FILTER TO PREVENT EYE STRAIN

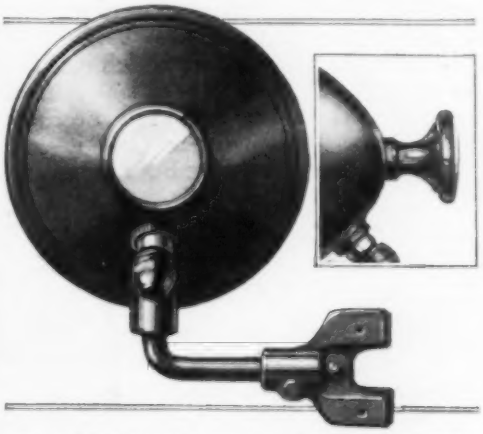
An inventor in Columbus, Ohio, has recently placed on the market a device for eliminating eye strain caused by motion pictures. This result is sought by placing a filter screen directly in front of the ordinary lenses in the picture machine. The filter is made of especially treated glass and has a slightly amber hue. It is held securely in a metal frame and can be attached to any projecting outfit. All light from the electric arc passes through it on its way to the screen, thereby filtering out the ultraviolet rays which some believe to be responsible for the strain on the eyes that arises from viewing motion pictures. The device is much simpler and more effective than the use of amber glasses by the spectators.



An Amber Lens, Attachable to Any Moving-Picture Machine, Designed to Eliminate the Ultraviolet Rays That are Considered by Some to Be the Cause of Eye Strain

SMALL ROAD MIRROR FITTED IN HANDLE OF SPOTLIGHT

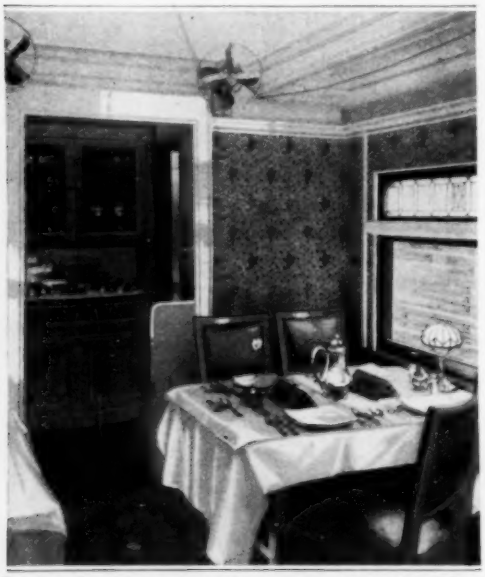
As an added feature of the already popular motor-car spotlight, a new lamp of this type has been brought out with a small concave mirror mounted at the back of its knoblike handle. During the daytime this gives a driver a fairly clear view of the road behind him, and also obviates the necessity of attaching a separate appliance to a car. The device is provided with the usual parabolic reflector as well as a special interior focusing arrangement. Its universal bracket can be clamped to either a windshield or fore door, as is desired.



The Small Mirror Mounted in the Handle of This Motor-Car Spotlight Gives a Driver a Glimpse of the Road at the Rear

DINING CAR DECORATED WITH WALL PAPER

A dining car decorated with wall paper is a new feature of the passenger service of a western railroad. The



Corner of a Dining Car, Showing the Homelike Effect Produced by Decorating It with Wall Paper

walls at the ends of the car's dining room and the panels around and above the windows have been covered with paper of an attractive pattern. This style of decoration was settled upon as the most desirable under certain conditions obtaining because of the all-steel construction and also because of the homelike atmosphere which it lends to the car. The paper used is prepared by a special process and then carefully varnished. It is believed that it will not only prove attractive but more sanitary.

AMOUNT OF MOISTURE IN OCEAN FOG

One of the interesting facts ascertained during investigations made recently aboard the ice-patrol, coast-guard cutter "Seneca" is that a cubic yard of fog at sea contains about .02 of an ounce of moisture; it was also found that the particles of moisture measure about .0002 inch in diameter. The average number of persistent nuclei in a cubic inch of fog was estimated at 16,000; numerous tests failed to reveal less than 6,500 in that amount of space, and on the other hand the number sometimes was as high as 800,000. Fog of the latter variety was found chiefly in cyclonic areas, which fact gives rise to the theory that fog nuclei at sea are chiefly particles of salt from evaporated spray.

NOVEL WAY OF ADVERTISING TOBACCO PIPES

A novel and attractive variation of the old grab-bag idea was successfully employed recently by a Saskatchewan firm to advertise its line of pipes. One of the store's display windows was filled with tobacco pipes of all styles and prices. To each a thread was tied; all of the threads converged at and passed through a hole in the inclosing wall back of the window. By paying 50 cents anyone was permitted to draw out one pipe by means of any thread he might select from the many

For a Uniform Charge Any Person could Secure a Pipe by Drawing One of the Many Threads That Passed from the Pipes through the Hole at the Back of the Window

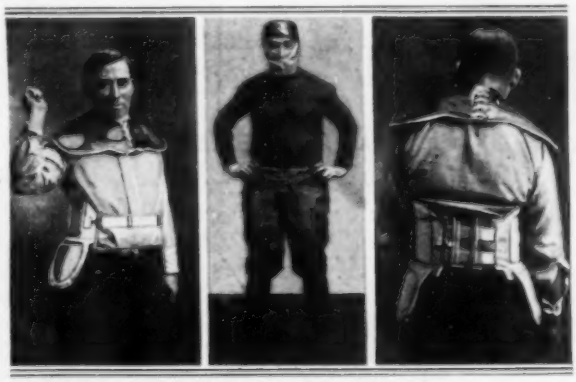
strands passing through the hole. One man secured a pipe worth $11.50.

LIGHT-WEIGHT TOGS MADE FOR FOOTBALL PLAYERS

Since speed has become of greater importance than mere weight, and the tactics of the game have been completely changed, football players have adopted lighter togs. The cumbersome bulkily padded uniforms, worn in the days of close formations, center rushes, and incessant line bucking, are being superseded by suits and armor of reduced weight that permit freedom of movement and quick action, without sacrificing their fundamental purpose of protection.

Forty-Ounce Breeches with a Sufficiency of Fiber Padding to Protect a Player Adequately

A complete outfit, weighing only about five pounds, is the recent development of a coach and conference official of national reputation. It more nearly approximates the baseball uniform in lightness than approved paraphernalia of previous design, and undoubtedly gives the wearer greater protection against serious injuries than did the old costumes of double the weight. In place of the felt, hair, and leather-covered paddings of several seasons ago, fiber has become generally accepted. It is shaped to fit the curves of the body and shields the vital parts by distributing the shock of a blow over a considerable area, instead of merely acting as a cushion and lessening its intensity.



Five Pounds Covers the Weight of This Outfit, Consisting of Fiber Shoulder-and-Body Protectors, 22-Ounce Breeches, and a Light Headgear with Pneumatic Mouth Guard

In the new uniform and its accessories, this material is used almost exclusively as armor. The knee breeches are provided in two weights, one amounting to 22 and the other 40 oz. In each case the thighs are adequately protected with fiber plates which are concealed in the garments, the heavier of which is obviously the most thoroughly padded. To safeguard the small of the back, the hips, and the lower ribs a 19-oz. protector is fastened about the waist. This, as well as a shoulder guard which weighs only 11 oz. and covers the collar bones, joints, the upper vertebræ, and gives considerable protection to the neck and its muscles, is a fiber fabrication worn beneath the outer togs. The separate parts of each of these devices are so hinged that the natural movements of the body are not impaired. With them in place, a player can bend freely at the waist line and use his arms almost as expeditiously as if his shoulders were bare.

Weight reduction has not stopped here, however. The player is given shoes weighing 12 oz. each, with ankle pieces and cleats of fiber. The soles are treated to make them waterproof. A light headgear, with a pneumatic protector for the teeth, completes the new phases of the paraphernalia. The latter takes the place of the old-fashioned nose guard, which always hindered breathing and was often discarded during the first few moments of play. It is attached to the sides of the headgear and firmly held

in position over the mouth, while an opening in the middle permits one to speak without trouble, even to the extent of calling signals.

Marker Which Shows the Number of a Down and the Distance to be Gained

The number of a down and the distance to go are shown by 6-in. numerals, painted on plates attached to a novel marker intended for the head linesman. By turning the staff 90°, or reversing the ends, he keeps spectators — and players too — informed regarding these points as the game progresses. The pole is jointed and the cubic members may be folded. This permits the device to be packed in small space.

BAG-HOLDING ATTACHMENT FOR HAND TRUCKS

An attachment for a two-wheel hand truck has been designed to aid in filling grain bags and the like. It consists of two parts, an upright beam and a curved member attached to it. The upright is fastened to the crosspieces which extend between the sides of the truck; the curved member is of metal and forms two arms to which an empty bag can be attached in such a way as to hold it open while it is being filled. When filled, the container can be wheeled off without any additional lifting. A setscrew at the back of the upright permits the device to be adjusted to bags of various heights.

LOCK HOLDS WHEEL TO RAIL WHILE FITTING BEARING

Another car-wheel clamp designed to expedite the work of applying new journal bearings to a truck when a hot box causes trouble on the road, is coming into use. Like certain similar devices of recent origin, it locks a wheel and rail together and allows the brasses to be readily removed when a box has been raised. From this it is evident that the necessity of prying down a wheel after jacking up a journal box is obviated. The clamp is U-shaped and held on a bar through which two hooks, adjusted by thumbscrews, are inserted. The latter take hold of the rail on either side of the wheel, while the clamp fits beneath the rail and grips the wheel flange. An adjustable lip, hinged to the upper part of the clamp, takes up the slack in case both the wheel and rail are small. The device weighs about six pounds and can be carried with a journal brass in a "dope" bucket.

TRAVELING-CASE CARRIAGE LATEST PERAMBULATOR

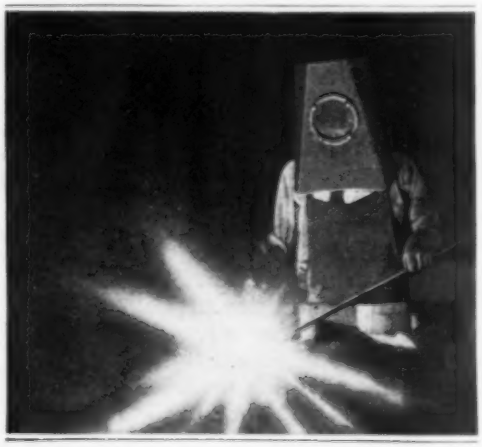
Especially designed to answer the requirements of those who reside in cities, a collapsible baby carriage is being brought out which takes the form of a traveling bag when closed. It weighs less than 17 lb. and offers three roomy compartments in which parcels and various personal articles for a child may be carried conveniently and out of sight. The wheels disappear, the handlebar folds down, and

This Collapsible Baby Carriage Occupies Little Space When Closed and is Easily Carried in Motors or Street Cars

the back and foot rest lock together, forming a neat-appearing bag, 17 in. long, 9½ in. wide, and 13 in. high, that may be thrown into the tonneau of a motor or carried into a street car without trouble. The exterior is finished in black, and the seat, back, and foot rest upholstered in maroon leatherette. Although exceptionally light in weight, it is understood to be of adequate strength to withstand average usage. It may be closed up, or reopened for use, quickly and without inconvenience.

ARC WELDER'S HELMET MADE ENTIRELY WITHOUT METAL

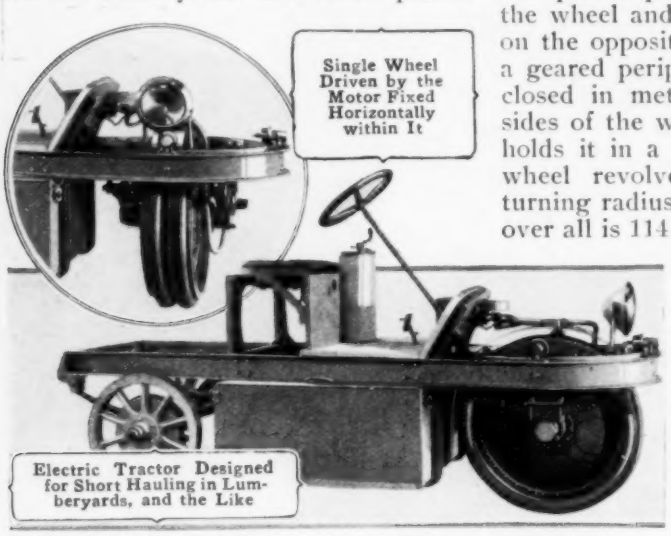
To meet the need of cooler and lighter helmets for electric welders, the Conference Board on Safety and Sanitation has designed and approved a new type of headgear which is made without metal. It is also fitted with circular lenses instead of square ones. The device is constructed of hard fiber, pressed into shape, and screwed at the back. A leather collar fitted in the opening cut at the front holds the lenses in place and is fastened by means of four fiber bolts and nuts. Two colored lenses are used, one of a special shade of green and the other red, protected on the outside by a thin disk of transparent glass that prevents the more expensive members from being pitted by the sparks thrown off from the torch. The helmet complete weighs less than two pounds and can be slipped over the head in an instant. Heat does not penetrate the fiber as it does metal, and for this reason the mask is claimed to be cooler than those ordinarily used. Furthermore, it is impossible for this device to conduct electric current, which is frequently a hazard with which a workman contends. The shape of the helmet is such that it allows air to circulate from the bottom, across the user's face, and out at the top. Another advantage is that the device may be taken off or put on readily.



Showing the New Fiber Helmet in Use by an Electric Welder: It is Claimed to Be Cooler and Lighter than the Devices More Commonly Employed

ELECTRIC TRACTOR WITH ONE-WHEEL DRIVE

An electric tractor having a one-wheel drive is being manufactured for use in lumberyards and other places where one or two horses commonly do short hauling. The special feature of the machine is the one heavy wheel set in front and containing the motor. The armature has a pinion at either end, one pinion pulling up on one side of the wheel and the other pulling down on the opposite side, both working on a geared periphery. The motor is inclosed in metal disks that cover the sides of the wheel. The steering fork holds it in a fixed position while the wheel revolves. The tractor has a turning radius of 78 in., and its length over all is 114 in. As high as five lumber trailers have been drawn by it. Current is supplied by a storage battery. The speed varies from four to 10 miles per hour, according to load, etc., while the drawbar pull ranges from 1,000 lb. in the smaller size to 1,500 lb. in the larger size.



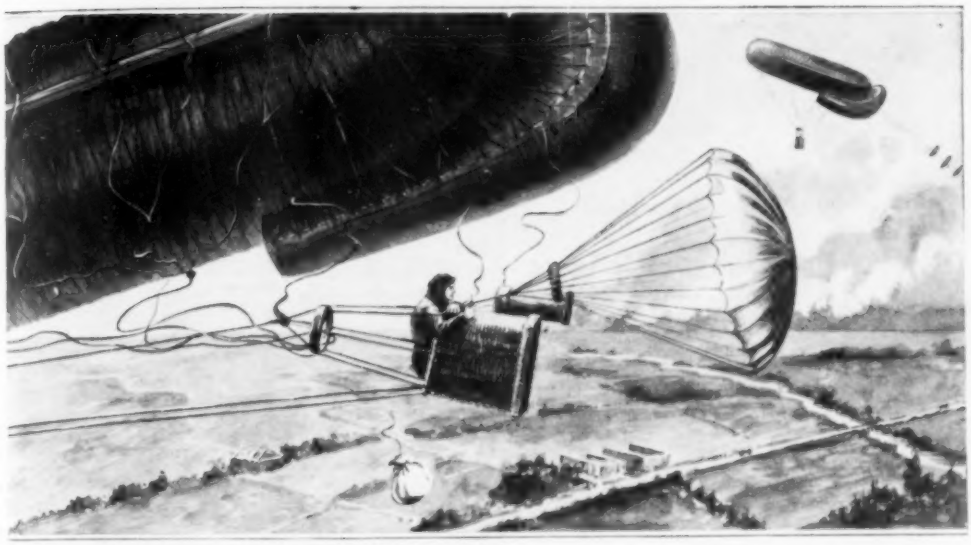
Single Wheel Driven by the Motor Fixed Horizontally within It

Electric Tractor Designed for Short Hauling in Lumberyards, and the Like

BATTERY OF SEARCHLIGHTS ILLUMINATE TOWN

Night illumination of a most novel kind is provided at Seal Beach, a California coast resort and amusement center. A battery of 41 large searchlights has been mounted on a special structure erected at the outer end of a long pier extending into the ocean. The lamps are arranged in two rows, one placed above the other, and trained upon the shore, which, being somewhat curved, may be seen for miles up and down the coast and far out on the water when subjected to the brilliant glare. The real purpose of the lights is to illuminate the water front, but in addition to this they also take care of a part of the street lighting of the town. Each lamp is mounted so that it may be turned to any angle, and on certain occasions the streams of light are played upon different points along the shore line. Occasionally, also, the upper row of lamps is turned seaward and the lower one skyward so that a solid bank of light is formed. Each of the searchlights develops 25,000 cp., so that a total of about 1,025,000 cp. is provided when the entire battery is in operation.

Forty-One Searchlights are Played upon Seal Beach, California, Nightly, Making Its Water Front Nearly as Bright as Day



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The Officer Cut the Parachute Ropes and the Car Swung Back to Its Normal Position beneath the Balloon

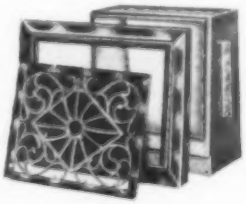
THRILLING EXPERIENCE MET IN CAPTIVE BALLOON

Rather unusual was the mishap that some time ago endangered an observation officer stationed in a captive balloon above the British lines in the western war theater. The big gas bag was held at the customary height of several hundred feet in the teeth of a strong wind. In some manner the parachute, which is always carried in a case attached to the car, worked out. It immediately unfolded and was driven in an upward direction with such force that it pulled the observer's basket, to which it was anchored, against the baggy rear end of the envelope. This brought the car practically to a horizontal position and almost threw the officer out. He saved himself, however, by quickly cutting the ropes holding the parachute. Thus freed, the basket swung back to its normal position below the middle part of the long balloon.

¶An Australian is said to have found a way of extracting lanolin directly from wool, which may add to Australia's industries one netting many millions.

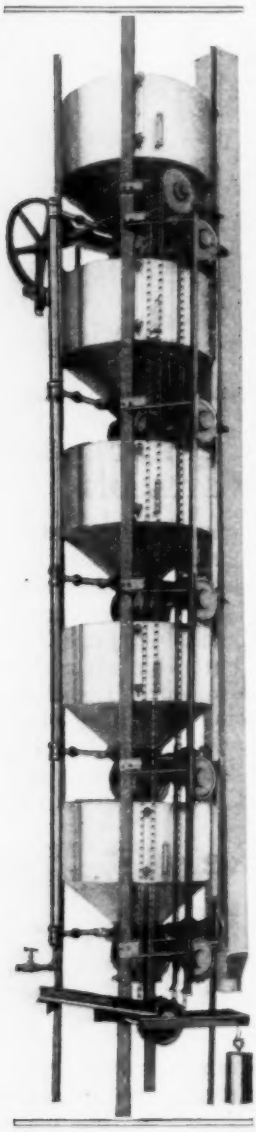
WALL REGISTER THAT DOES NOT MAKE STREAKS

A common objection to wall registers for hot-air furnaces, namely, that they cause streaks to form on the wall around the opening, has been overcome by a register of special design. The feature which prevents this streaking is an interlapping slip joint. The tight joining of the parts is effected by placing the steel frame, which has a beveled flange around its sides, over a metal projection around the opening in the box, or chamber, which constitutes the terminus of the hot-air pipe. The frame is then securely fastened to the box, after which the grille is inserted, the bottom part being put in place first, and then the whole is pushed into the frame. In this way the projecting metal edge of the box is fitted tightly between the frame and the grille. Two large oval-head bolts fasten the latter into position. This construction allows the hot air to escape only through the grille.



PEA WASHER AND BLANCHER FOR CANNING FACTORIES

For washing and blanching peas preparatory to canning them, a Wisconsin man has evolved a machine which performs its work sanitarily, for it does not use the same water over and over. The apparatus can likewise be employed for steam-baking beans. It is arranged with five tanks supported one above another in a vertical frame. On the under side of each is a discharge valve which is operated by means of an endless chain that actuates intermediary mechanism. When in service, a measured quantity of peas with a suitable amount of water is put in the upper receptacle, and kept at any desired temperature. When the chain has made a complete revolution, which it does in a prescribed period, the valve is opened and the product discharged into the tank below, leaving the former one ready for a fresh batch, which is introduced with clean water. This cycle continues, peas ready for packing being discharged at the bottom, and raw ones fed in at the top.



FREEDOM AND BEAUTY MARK LIFE IN NOVEL SCHOOL

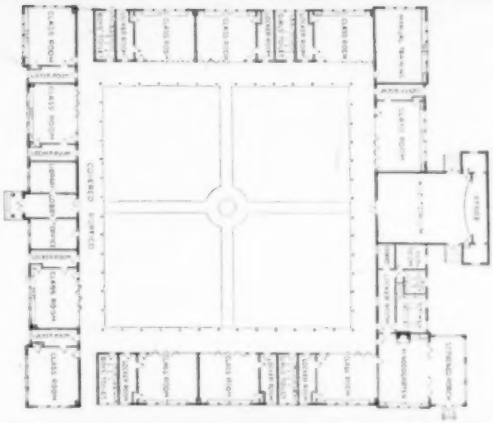
A school in which the work is made as interesting as play—though it is not play—and which has rooms and rules that impose the least possible restraint on the pupils, is maintained in a picturesque spot just outside of San Diego, Calif., overlooking the Pacific. Not the least important feature of the institution is the style of the building, which itself suggests freedom and lack of restraint—both of which are characteristic of the school's methods. It is a one-story structure containing classrooms, workrooms, etc., opening onto an inner courtyard, about 100 feet square and partly filled with wild flowers. A portico overlooking the yard shuts out the glare of the sun from the classrooms. Opening onto the portico are folding doors which are always open in school hours, giving the pupils within a landscape view and eliminating the prisonlike seclusion that often prevails in classrooms.

An illustration of the school's methods is found in the fact that the youngsters were taught something of the use of tools by being required to mend one or more of their own broken toys. In this work only one rule was laid down, namely that each task begun must be completed. Though this institution was begun as a kindergarten only, its scope has broadened until now high-school work is given. The older pupils edit, set up, and print a school paper which has paid a profit and furnished business as well as journalistic experience. In studying domestic science younger girls learn a good deal about arithmetic as well as cooking, because they are required to calculate their kitchen needs and purchase their supplies from the grocer. The older scholars recently planned and laid out an athletic field as a part of their school work. No rewards or prizes for scholarship are permitted, the spirit of competition being eliminated from the school on the theory that it harms pupils who become discouraged and humiliated by defeat.

Front View of a Schoolhouse near San Diego, California, Designed to Afford Its Pupils a Large Measure of Freedom

There Is Plenty of Fresh Air in the Classrooms, Whose Folding Doors Open onto a Courtyard Filled with Wild Flowers

The Wide, Cool Portico Protects the Classrooms from the Glare of the Sun



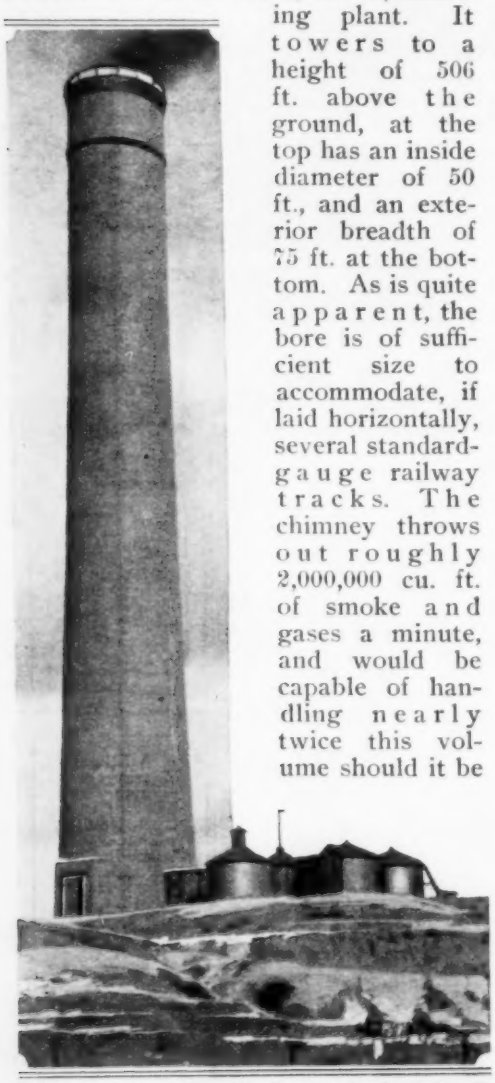
Ground Plan of the School, Showing the Courtyard, Surrounded by a Covered Portico, and Other Features Which Distinguish It from the Ordinary School

A View of the Athletic Field and Garden Beds, Which were Laid Out and are Cared For by the Pupils as Part of Their School Work

A School Workroom in Which There Is But One Rule, Namely, That Each Child shall Finish the Work He or She Begins

HUGE CHIMNEY IS ERECTED FOR MONTANA SMELTER

There are few, if any, smokestacks in America larger than one lately erected at a Great Falls, Mont., smelting plant. It towers to a height of 506 ft. above the ground, at the top has an inside diameter of 50 ft., and an exterior breadth of 75 ft. at the bottom. As is quite apparent, the bore is of sufficient size to accommodate, if laid horizontally, several standard-gauge railway tracks. The chimney throws out roughly 2,000,000 cu. ft. of smoke and gases a minute, and would be capable of handling nearly twice this volume should it be necessary. Its height is not alone for the purpose of increasing the draft for the furnaces, but also to enable the sulphur fumes to be carried far enough into the upper atmosphere to prevent serious injury to surrounding vegetation. The structure weighs approximately 17,000 tons and is built to withstand a 125-mile an hour hurricane. The dust-settling chamber, near its base, measures 176 ft. in width and 478 ft. in length. Some 13,000 tons of bricks, more than 3,000 barrels of cement, as well as lime and sand in proportion, and 200 tons of acid-proof mortar, were used in constructing the stack. These figures do not include the foundation materials.



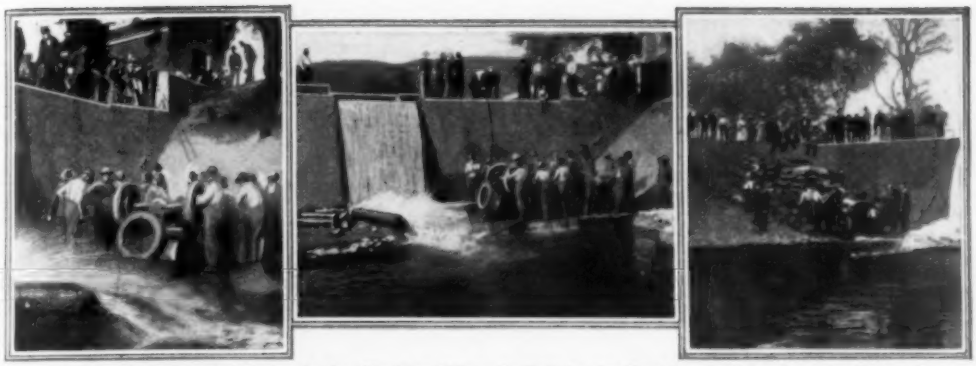
This is One of the World's Largest Smokestacks: It Measures 506 Feet from Base to Crown

MACHINE APPLIES ROCK DUST TO MINE WAYS

The Bureau of Mines has developed a machine for spreading rock dust in passageways of bituminous coal mines to prevent dust explosions. In the early experiments with rock dust, finely pulverized limestone was used, 75 per cent of which passed through a 100-mesh sieve. Later experiments showed that a coarser dust could be employed, crushed rock which would pass through a $\frac{1}{16}$-in. mesh proving practically as efficient as the finer powder, and much less expensive. In the original treatment the rock dust was applied by hand, but after a time a new layer of coal dust settles over the rock layer and the latter must be renewed. This can best be done with the blowing machine which the bureau has brought out. It uses air from a blower at a pressure of about two pounds per square inch.

GIRL-PACKED TOURING CAR FALLS OVER DAM

Remarkable features were not missing in a motor-car accident that occurred recently near Larned, Kan. A machine carrying seven high-school girls backed over the edge of a dam across Pawnee Creek, turned turtle, and fell 16 ft., pinning six of the young women beneath it, but killing none of them. The top of the dam is used as a roadway, but is reached by a slightly curved and somewhat sharp incline. In attempting to ascend this approach the engine was stalled, and before the girl driver could make the brakes hold, the

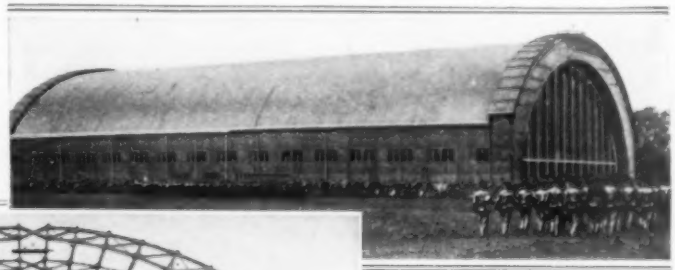


Six Girls were Imprisoned Beneath the Machine When It Fell in the Position Indicated at the Left. It was Righted, Pulled across the Stream, and Withdrawn in the Manner Shown in the Other Pictures

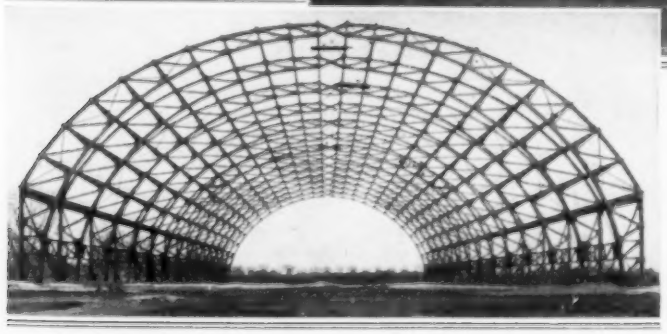
heavy machine rolled back, crashed through a gas-pipe railing and tumbled bottom up to the concrete apron below. One girl saved herself from injury by jumping. The others were imprisoned beneath the car, which fortunately struck a place that was not swept with water. All of those who fell with the machine were badly hurt, but with one possible exception—that of the girl driver—no one's injuries were mortal. The accident was witnessed by several men who rushed to the rescue and lifted the car sufficiently to withdraw the girls from beneath it. The machine was later righted and drawn out of the creek by some 40 men aided with block and tackle.

BIG UNIVERSITY ARMORY HAS UNUSUAL FEATURES

In the impressive new armory of the University of Illinois, at Champaign, have been combined a number of unusual features to make it comply with certain requirements, namely, that the building should have an unobstructed floor space large enough to permit military drill by a large student body and also high enough for baseball and football practice. The armory is 400 ft. long, 200 ft. wide, and 98 ft. high from its sawdust floor to the apex of the arch.



The Illinois University Armory, 400 Feet Long, 200 Feet Wide, and 98 Feet High



The Steel Framework: Each Arch is Hinged at the Apex and Bases

An especially constructed crane was used to hoist these arches one by one; it grappled each at rather widely separated points to prevent the light steel spans from buck-

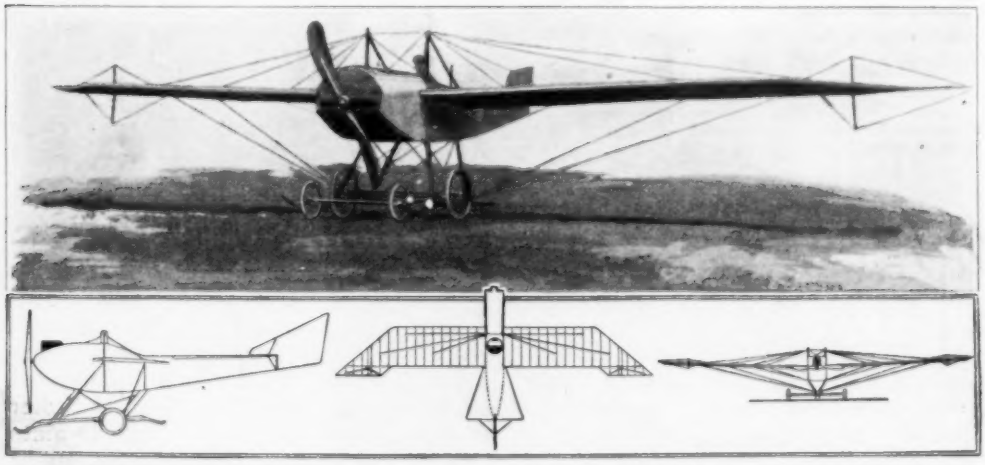
ling. Though comparatively slender, the arches have great resisting power when in place. Each is made in two parts and is hinged at its apex and to anchors at its bases. To provide against the enormous outward thrust on these anchors, double steel tie rods, laid underground, hold them together. The beams used in the arches are of rolled steel, a cross section of which is H-shaped, this form being regarded as preferable to the less artistic H-shaped beams made up of several angular pieces riveted together.

The building is lighted chiefly through the end walls, which are entirely of glass, the windows being double-glazed in single casements. Because of these walls, practically impervious to cold, and because of other features the armory has been heated by steam from a central heating plant for 60 cents per hour, soft coal costing $1.25 per ton being used. Unlike most buildings, the end walls do not support the roof, since the arches are self-supporting. The strength of the uprights in the ends was calculated the same as horizontal floor beams would be because of the great wind pressure that strikes them from the side. The armory cost $250,000.

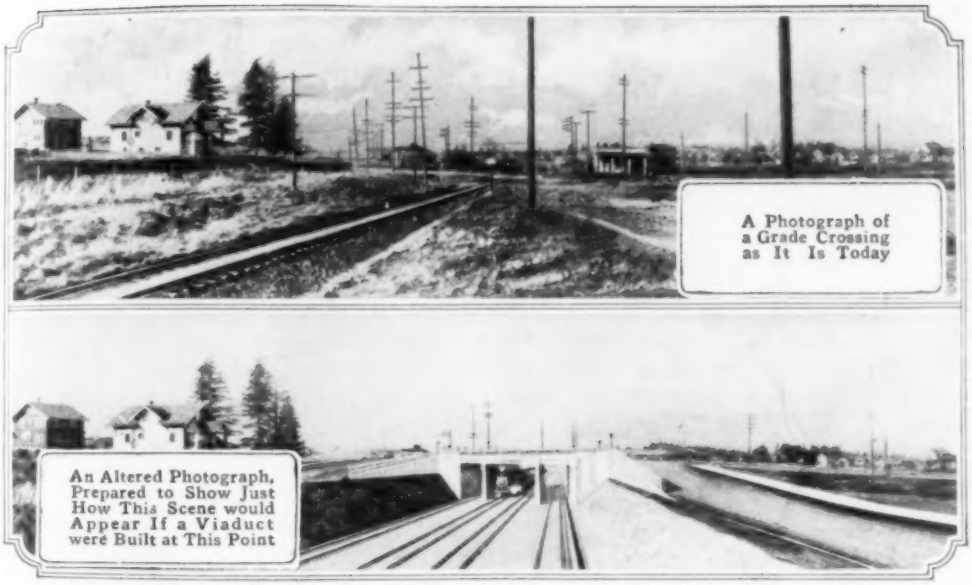
¶Last year 700,000,000 ft. of timber was cut on the national forests.

MONOPLANE OF LOW POWER IS FAST AND STABLE

Quite encouraging results are reported to have been attained in test flights conducted at Nahant, Mass., with a new monoplane that embodies a number of features which are distinctive. The craft is particularly designed for military service and is intended to have inherent longitudinal and lateral stability. Furthermore it is claimed to have a lifting capacity and speed equal to that of other machines mounting engines of double the horsepower it requires. An experimental machine, recently demonstrated, is built with a wing spread of 49 ft. and an aggregate supporting area of 240 sq. ft. Although it weighs only 900 lb. and is driven by a 50-hp., seven-cylinder rotary motor of the Gnome type, it has a tested carrying capacity of three passengers and 20 gal. of fuel, and develops a maximum speed of 100 miles an hour. The body is light and extremely short. The elevator planes, shaped like a bird's tail, extend along either side of the body from the trailing edge of the wings to the rudder. The craft's center of gravity is near the leading edge of its wings. When, in flight, the plane presents a greater angle of incidence than is normal, the speed slackens, relieving pressure upon



This New American Monoplane, in Addition to Having Inherent Lateral and Longitudinal Stability, Attains Great Speed with a Low-Power Engine. The Diagrams Show Some of the Peculiarities of Its Design


A Photograph of a Grade Crossing as It Is Today
An Altered Photograph, Prepared to Show Just How This Scene would Appear If a Viaduct were Built at This Point

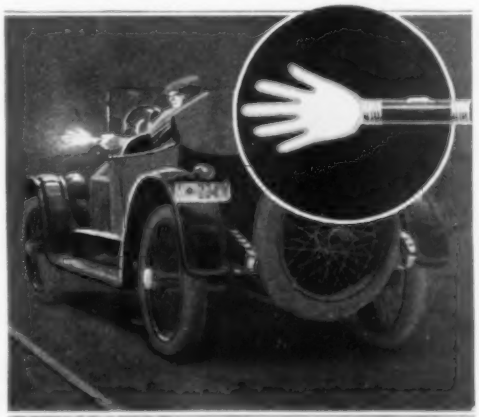
the negatively inclined elevator and allowing the machine to be drawn back to a proper angle by gravity, the center of pressure acting as a fulcrum. Should the angle of incidence become less than normal, however, the action would be reversed. In such a case, the pressure being lessened on the wings, the nose of the craft would turn down, the speed increase, and greater pressure would be exerted on the elevator, thus restoring the machine to a normal angle of flight. The planes are flat on the under surface. This, it is asserted, assures smooth sailing and lessens drift. Should the craft tilt too much, it would automatically turn toward the low side and regain lateral poise.

PROPOSED IMPROVEMENTS SHOWN BY PHOTOGRAPH

For the purpose of ascertaining just how certain proposed public improvements would look, such as the substitution of viaducts for grade crossings, the officials of Portland, Ore., have employed a delineator who photographs the site of the proposed alteration and then draws the improvement to scale on the photograph, matting out the features of the landscape that should no longer be apparent. If even greater realism is desired, this retouched photograph may itself be photographed. When the work is done skillfully the altered picture closely resembles a photograph that has not been retouched, and very accurately delineates the improvement as it would appear when completed.

ILLUMINATED SIGNAL HAND FOR MOTORING AT NIGHT

One of the simplest of the many signaling devices now being made for automobilists consists of an illuminated

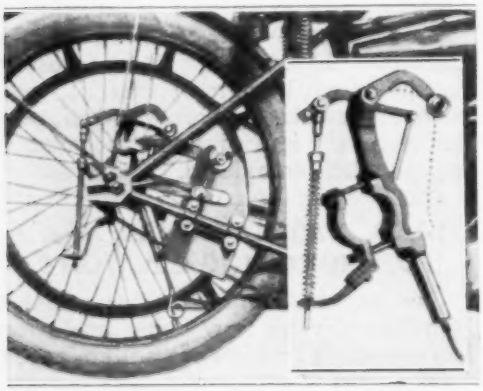


A Simple and Effective Automobile Signal: The Hand Is of Celluloid and Is Illuminated from Within by a Flash Light

hand which a driver can use at night in the same manner as he signals with his own hand in the daytime. The hand is made of brown celluloid, with the fingers outstretched as if in an attitude of warning; it is fastened over the bulb of an electric flash light which is so constructed that the whole of the translucent casing is evenly illuminated; at night it can be seen a distance of 300 ft. It has been suggested as useful for traffic officers who are on duty at night. In an emergency the celluloid portion can be removed and the lamp used as an ordinary flash light.

TIRE PUMP OPERATED BY RUNNING OF MOTORCYCLE

A tire pump has been invented which pumps up a motorcycle tire while the vehicle is running. With it

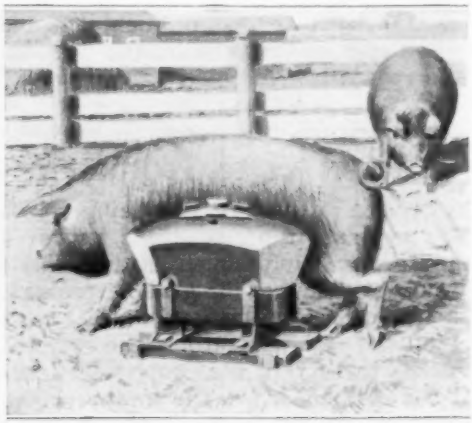


A Tire Pump Mounted on the Hub between the Rows of Spokes and Operated at Will: A Lever Extending beyond the Spokes Travels up a Track Fastened to the Fork and Then Returns to Normal Position, Thereby Operating the Pump as the Wheel Revolves

a slow leak can be counteracted, making it unnecessary to stop and repair or change tires. The device includes an ordinary small tire pump which, with a series of levers and a spring, is clamped to the hub of the wheel between the two rows of spokes. One lever with a roller at its free end projects beyond the spokes and is so positioned that with each revolution of the wheel it travels up a track rigidly fastened to the forks of the wheel. After passing over this track the lever is returned to its normal position by the action of a spring. This double action of the lever draws the piston of the pump in and out. A tire can be inflated in less than two minutes. A wire connected with the handlebars is used to disconnect the levers when desired.

HOG-OILING DEVICE SAVES DISINFECTANT

As a labor-saving substitute for spraying hogs with disinfecting oil to protect them against vermin, a simple machine has been invented that enables hogs to oil their bodies by rubbing against it. The lower part of the device consists of an oblong iron reservoir, secured to a suitable foundation; fastened above it by bolts is a second hollow casting pointed at both ends, the top of which is convex and the six sides slightly concave. In the bottom of the reservoir is a 4-in. well into which fits a plunger that is connected by a pipe with a distributing cap fitted on top of the oiler. Oil is poured into the machine through a hole near the cap. Pressure against any part of the upper casting causes oil to rise through the plunger to the cap and flow down the outside. That which does not rub onto the body of the animal drips back into the tank through an opening between the upper and lower castings.



A Hog Oiler That Has Little to Get Out of Order, and Saves All Oil That is Not Rubbed onto the Bodies of the Animals

Two Campers Carrying Two Canoes Overland by Means of Yokes, While Others of the Party Carry the Heavier Articles of the Outfit

YOKES MAKE CARRYING OF TWO CANOES EASY

Pine yokes, such as are sometimes used in carrying water, were recently found by a camping party of four to be very convenient in making portages with two canoes. The yokes weighed but little and were easily made. Straps at each end hooked into eyes in the ends of the canoes so that the latter were easily taken overland by two persons while others of the party carried the heavy camp articles. In this way the load was less tiring to all than it would have been had the entire outfit been divided between the two crafts and two persons assigned to each canoe. Wide straps were also found to be quite satisfactory substitutes for the wooden yokes.

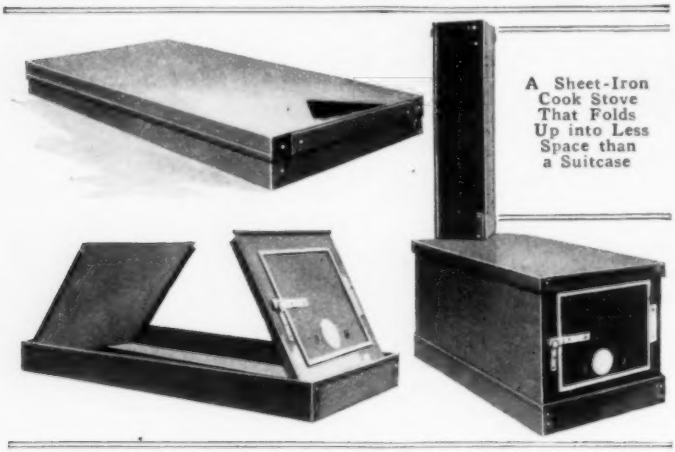
¶It has been found that jack pine, grown extensively on national forest lands too poor to grow other trees, is well suited to making "kraft" paper, which is used for wrapping purposes.

GAS-BURNER ATTACHMENT SAVES FUEL

A simple attachment for a gas stove which effects a considerable saving in fuel consists of a metal rim designed to be fitted down over a burner so that the upper edge is just even with the grate covering the top of the stove. The rim can be made the proper size by adjusting the overlapping ends and then fastening them with clips which are provided. The attachment protects the flames from drafts, concentrates all the heat within a circumscribed area, making the gas consumed more effective, and hence makes it possible to use less gas. The device, which is patented, can be used with equally good results on oil and gasoline stoves.

COLLAPSIBLE COOK STOVES FOR OUTINGS

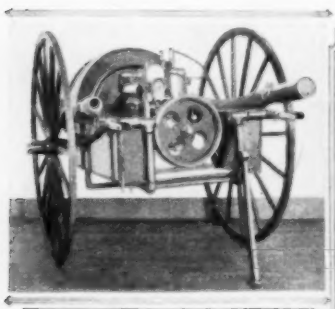
A collapsible stove which will burn wood or other fuel is one of the latest additions to the list of convenient and compact articles that now are available for motorists and campers. This stove, though made of heavy sheet iron, weighs only 13 lb., and when folded up occupies less space than a suitcase, being 22 in. long and 12 in. wide. It is composed of a top and bottom shaped like large rectangular pans; these can be fitted together to form a case in which the four sides and a three-sided stovepipe can be packed. If desired, an extension can be put on the smokestack. One end has a hinged door in which is a damper to control the draft. When set up, the body of the stove stands 11 in. high.



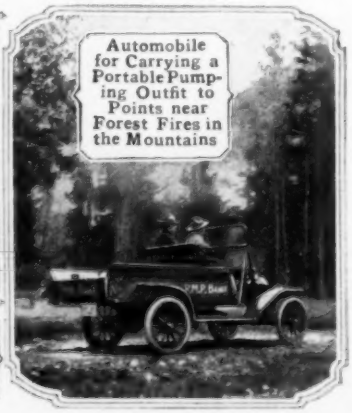
A Sheet-Iron Cook Stove That Folds Up into Less Space than a Suitcase

FIGHT FIRES IN MOUNTAINS WITH PORTABLE PUMPS

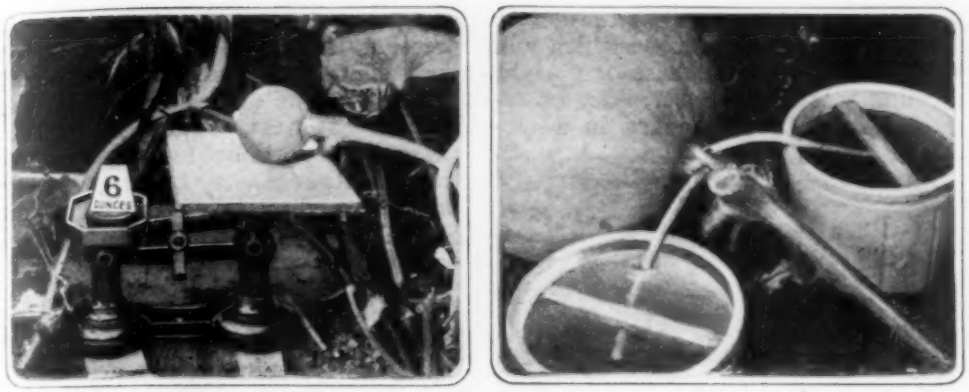
Portable fire-fighting apparatus, designed especially for combating forest fires in mountainous regions, is now being used with success by the Dominion Parks branch of the Canadian government. The full outfit consists of a light automobile truck, a two-wheeled cart, and a portable rotary pump run by a marine-type, two-cylinder gasoline engine, the pump and engine being mounted on an aluminum base. The automobile is used to transport the pump, with its engine, as far as the condition of the road or trail will permit, after which the apparatus may be carried by two men or drawn by hand on the cart; in some instances the cart is attached to a car or wagon. When fires are high above the water supply, as is often the case in the mountains, two or more pumps are used. The first pump is able to draw water a distance of 500 ft. and to an elevation of not more than 150 ft. and discharges it into a canvas tank; the second outfit relays the water 1,000 ft. farther and to a level not more than 75 ft. higher than the tank. At a pressure of 90 lb. water can be thrown 40 ft. from the nozzle. On some occasions the pumps have shown even greater efficiency.



Pumping Outfit and the Cart Sometimes Used to Carry It along Mountain Trails



Automobile for Carrying a Portable Pumping Outfit to Points near Forest Fires in the Mountains



FROM PHOTOGRAPHS BY COURTESY OF SCIENTIFIC AMERICAN

Left: Method of Weighing the Pumpkin at the Beginning of the Experiment. Right: The Jars Contained a Rich Sugar Solution Which was Fed through Two Wicks Inserted in Holes Made in the Stem

PUMPKIN FATTENS RAPIDLY ON SUGAR SOLUTION

Feeding sugar solution to a pumpkin, thereby causing it to grow at an astonishing rate, is the novel experiment which has been performed to demonstrate that certain plants can be made to develop with great rapidity with the aid of proper artificial-food stimulus. In four days the pumpkin in question increased in size many fold. Very simple apparatus was used. A healthy young pumpkin was selected, shortly after it had begun to be well formed; with a sharp knife two incisions were made in the stalk close to the fruit, care being taken not to break the stalk or penetrate it clear through. Into these holes the ends of two lamp-wicks of proper length were so inserted as to be secure. The other ends of the wicks were immersed well down into a sugar solution, contained in two jars set in the ground close by the fruit. The solution was made by pouring into the water-filled jars as much sugar as would eventually dissolve with periodic stirrings. The apparatus required no attention except that the jars had to be replenished daily, so great was the amount of sugar and water taken up by the pumpkin. Accurate account of the weight was kept by means of a small scale set on the ground near by. Before the experiment began, the pumpkin weighed 6 oz.; after four days of fattening, it was as large as one that has been weeks in maturing. It has been known for some time that certain plants greedily absorb sugar solution, but this experiment demonstrated the fact with special vividness.

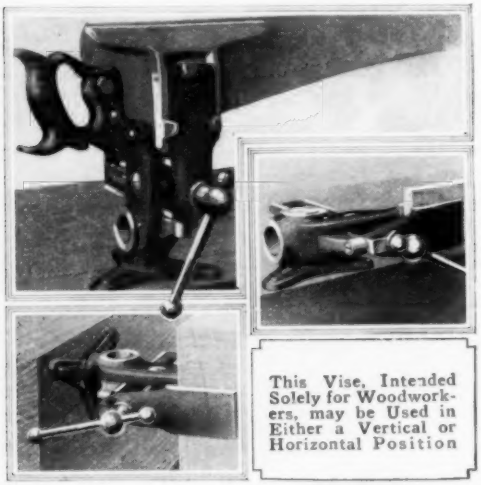
GOOD POINTS ARE EMBODIED IN CARPENTER'S VISE

Convenient features for the carpenter are to be found in a new vise designed solely to meet the needs of woodworkers. It is constructed of steel and so arranged that it may be used both vertically and horizontally and locked at any angle. These adjust-

FROM PHOTOGRAPHS BY COURTESY OF SCIENTIFIC AMERICAN

Photographs of the Fattening Fruit Taken on Four Successive Days, Showing That in This Short Time Its Size Increased Many Fold

ments are possible because the device is mounted on a fixed base which will hold it in either a sidewise or upright position. It may be fitted to, or removed from, this standard in a moment's time. Therefore, by attaching an extra base at a convenient height on one side of a bench, the vise may also be used to hold doors, windows, and other large, heavy pieces while they are being dressed down and fitted. The jaws are 2½ by 3½ in. in size and open 5 in. Special clamps are provided so that the tool may be used as a saw vise when desired. All the parts are interchangeable, and the device complete weighs 15 pounds.



This Vise, Intended Solely for Woodworkers, may be Used in Either a Vertical or Horizontal Position

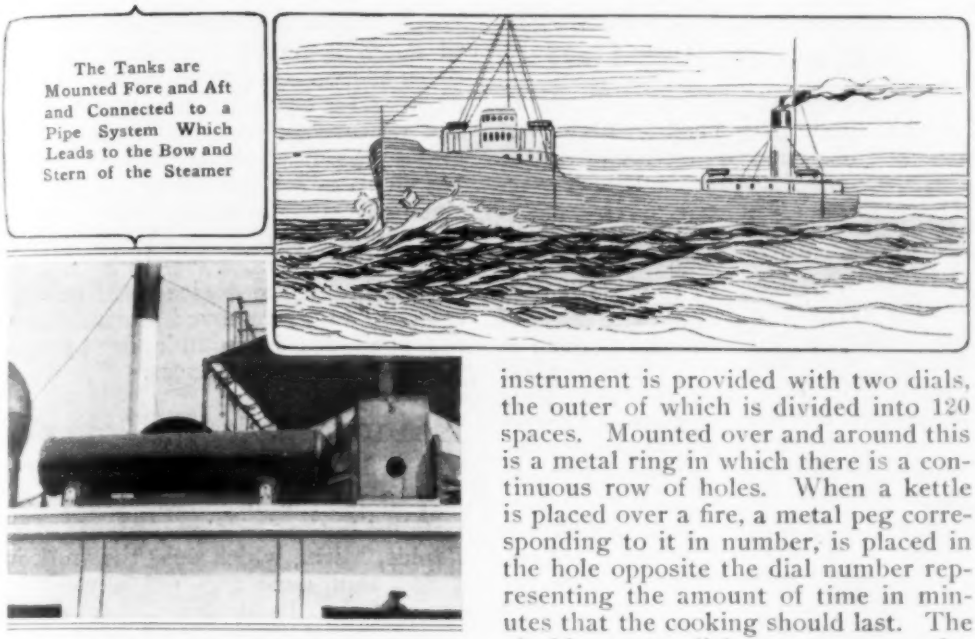
INSTRUMENT FOR MEASURING HARDNESS OF METALS

An instrument which is designed to determine the hardness of metals and metal products independent of dimensions, shape, and location of material tested, is now being manufactured in the East. The outfit consists of six standard bars of square cross section, ½ in. on a side and 6 in. long, also 12 steel balls, about ⅛ in. in diameter, measuring scales, and a set of tables. In determining the hardness of material the housing, containing a standard bar, and the metal section being tested are placed so that when pressure is applied the ball between them will produce a spherically shaped impression in both. The diameters of the indentations so obtained are measured by means of the scales, and the relative hardness of the two metals, which is proportional to the size of the two indentations, may be read, without calculation, directly on the tables included in the outfit. Since the pressure test is a comparative one, the pressure applied may be varied without impairing the accuracy of the results. The surface of the standard bars can be ground off after being marred by tests so that they can be used several hundred times.

BICYCLE SIDECAR FOR TWIN BABIES

In endeavoring to solve the problem of how he could take the twins in his family for outings together, a father, living in South Glen Falls, N. Y., finally devised a sidecar for his bicycle, constructing it largely from an old bicycle. This attachment consists of a neatly finished body mounted on a framework of piping fastened to the side of the bicycle. The body contains two seats, tandem, and has arms, a front, and a back high enough to keep the children from falling out. An old bicycle wheel, protected by a mud guard, is used as the third wheel of the conveyance.

A Homemade Sidecar, Attached to a Bicycle, Built for Twin Babies



The Tanks are Mounted Fore and Aft and Connected to a Pipe System Which Leads to the Bow and Stern of the Steamer

STEAMERS CARRY STORM OIL IN STEEL TANKS

Reservoirs of oil with which to pacify the waters when a sea is running high have been installed on a number of steamers and barges navigating the Great Lakes. The equipment in part usually consists of two cylindrical steel tanks, one mounted ahead and the other aft on a deck. Pipes fitted with drip valves which regulate the flow of oil lead from these containers through ports at the bow and stern. When a vessel is caught in a severe storm the oil is allowed to run out and spread in a thin film on all sides, calming the waves and enabling the boat to ride much more evenly on its keel than it otherwise could.

ELECTRIC APPARATUS TIMES COOKING IN CANNERIES

Intended particularly for use in the process rooms of canneries, an electric signal clock of simple construction is made which enables the contents of as many as 120 kettles to be cooked uniformly and without confusion. The instrument is provided with two dials, the outer of which is divided into 120 spaces. Mounted over and around this is a metal ring in which there is a continuous row of holes. When a kettle is placed over a fire, a metal peg corresponding to it in number, is placed in the hole opposite the dial number representing the amount of time in minutes that the cooking should last. The clock's outer dial moves one point every minute. When a metal hand, carried by the latter, comes in contact with one of the pegs, an electric gong is sounded. A glance at the instrument shows which of the pegs has been touched by the indicator. It is then withdrawn and the contents of the kettle it represents removed from the fire. This prevents under and overcooking.

When the Bell Rings It Indicates Which of 120 Different Kettles should be Removed from the Fire

ELECTRIC-LIGHTED NUMBER PLATE FOR DWELLING

For residential purposes a luminous number plate has been brought out which is designed to be attached to the conventional electric porch lamp of the ceiling type. The appliance is triangular in shape and made of metal. A pane of opalescent glass covers the front surface and forms a backing for the numeral slides, stamped from metal, which are held in grooves. The interior of the housing is hollow and at the top and bottom are rings which permit the device to be mounted. The lower of these holds the globe of the porch lamp while the upper is gripped by the ring on the fixture. This arrangement does not appreciably lessen the efficiency of the porch lamp nor destroy the sightliness of it. The numeral frame accommodates as many as five units, each 2½ in. high. As is obvious, its operation does not necessitate the use of extra current—providing one is in the habit of keeping a porch lamp illuminated continuously at night—and its installation is a simple matter. Since new number slides are inexpensive and readily acquired, and the device itself quickly attached to, or removed from, a lamp, the appliance is suitable for persons who lease their residences.

RIDDLING MACHINE GRADES SAND IN SIX SIZES

A simple riddling machine has been installed in the filtration plant at Grand Rapids, Mich., which does the work in a day that once required a week to perform by hand labor. A motor operates a shaft equipped with cams that shake a suspended trough into which gravel is emptied. The trough is set at a slight angle, causing the material to travel over some or all of the six screens of various sizes which constitute its bottom. In this way the gravel is speedily divided into six grades, and falls into separate bins. The material so separated is used in the filter beds.

A Filtration Plant's Riddling Machine Which is Operated by a Motor and Separates Gravel into Six Grades

RED CROSS PREPARES FOR HEAVY DUTIES OF WAR

With the calling of many thousands of men into military service in this country the American Red Cross has been quick to enlarge its facilities and adjust itself to its greatly increased responsibilities. What is probably the most important work which it has ever undertaken for the assistance of the medical service of the army has been the organization of base hospital units from the personnel of the larger civil hospitals in this country. Thirteen of these are now perfected and seven are in process of organization. Each base hospital is equipped to receive 500 patients, one hospital being needed for every 20,000 men. On the outbreak of war these base hospitals are transported to the seat of military operations. When called into active service both they and their staffs pass under the exclusive authority of the War Department. The Red Cross also contemplates the establishment of intermediate depots throughout the country which will aid in forwarding supplies to the soldiers at the front. Attention is called to the fact that the Red Cross cannot accept packages designated for particular persons; supplies designed for certain regiments or companies will be accepted only on condition that in case delivery to designated troops proves impracticable, they may be donated to other troops. Perishable and bulky articles of food and drink will not be received. Included in the list of acceptable supplies are reading matter, games, comfort bags, pajamas, socks, towels, pipes, smoking tobacco, cigarettes, chewing gum, hard candy, chocolate in tin boxes, and other delicacies in tins. The helping of soldiers' families left destitute is a task contemplated by the Red Cross. Any person wishing to contribute money to the society should send it to the treasurer of the local chapter or checks may be made payable to the American Red Cross at Washington. In many cities campaigns for extra funds have already been undertaken.

FOUNTAIN ADDS TO CHARM OF SHASTA SPRINGS

The beauty of Shasta Springs, which are visited by so many travelers en route from San Francisco to Portland, Ore., or vice versa, is much enhanced by an artificial fountain which rises from the midst of the irregularly stepped cascade. This fountain consists of a single perpendicular stream of water which in falling back to the earth forms a beautiful white plume of water and spray. The pressure which throws the column many feet into the air is supplied by a reservoir near by. At night electric bulbs, tinted blue, green, and red, light up the falls and produce a wonderful effect. The force of the cascade is employed to turn a wheel which lifts a supply of the mineral water to a hotel on the plateau above the falls.

The Cascade at Shasta Springs, California, the Beauty of Which is Much Enhanced by the Artificial Fountain near the Top

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¶ Plans are being made to rebuild, along artistic lines, certain districts in Dublin that were partly devastated during the recent Irish revolt.

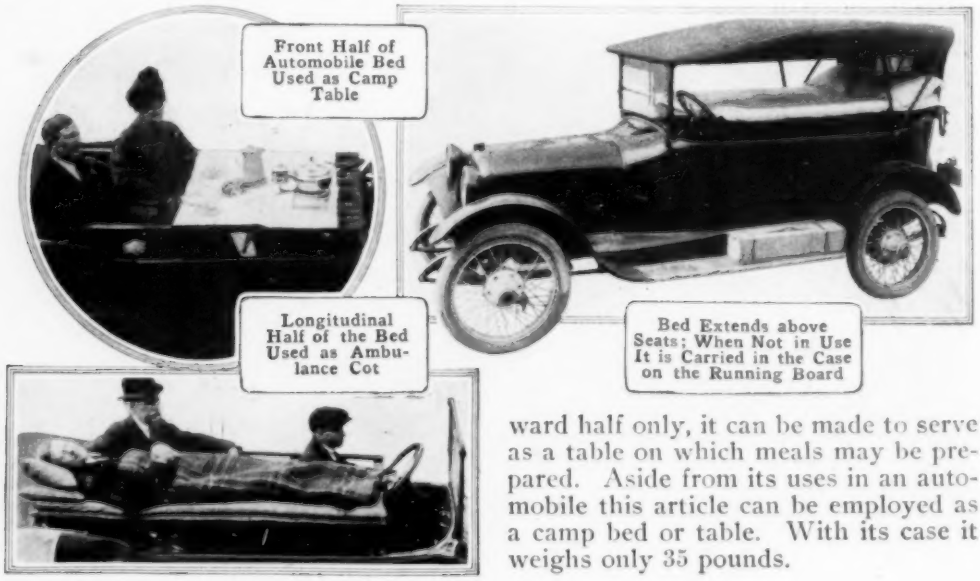
HUMIDOR WITH ELECTRIC FAN FOR CIGAR CASES

A humidor which gives the atmosphere in all parts of a cigar case, vault, or the like, the proper degree of moisture, consists of a 4-in. electric fan which revolves over a reservoir, about the size of a cigar box, containing absorbent material that should be kept moist. The fan circulates the air thoroughly, and serves to prevent deposits of moisture on the walls of the box. The fan itself is inclosed in a case, three sides of which are celluloid and serve as advertising transparencies. A red electric bulb inside the case flashes on and off every 30 seconds.

A Humidor Having Advertising Transparencies, and an Electric Fan Which Keeps the Moisture Circulating

MOTOR-CAR CAMP BED HAS MANY USES

Convenience and compactness characterize a camp bed for motorists which is so constructed that it can be laid across the tops of the seats of an automobile whether the top is up or down; when not in use the article can be folded up and carried in a small waterproof case on the running board. Either five or seven-passenger cars can be equipped with this bed, which is the same size as a house bed. It is secured to the side brackets of the car's top and is supported by legs having swivel hinges, so that they can be adjusted to rest on the sills of any car; it does not mar the finish of the vehicle, and the doors can be opened when it is set in place. It is made in sections, of thin slats; coil springs add to its comfortableness. Because of its sectional construction one longitudinal half can be used alone, as an ambulance cot, or the like. The framework supporting the bed does not interfere with driving the car. By setting up the forward half only, it can be made to serve as a table on which meals may be prepared. Aside from its uses in an automobile this article can be employed as a camp bed or table. With its case it weighs only 35 pounds.

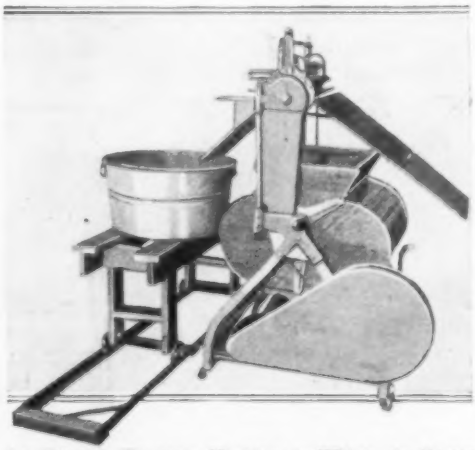

Front Half of Automobile Bed Used as Camp Table
Longitudinal Half of the Bed Used as Ambulance Cot
Bed Extends above Seats; When Not in Use It is Carried in the Case on the Running Board

IRISH WOMEN GATHER FUEL IN PEAT FIELDS

OWING to increased demand for other fuels and lack of men, great numbers of Irish women are now engaged in procuring peat from trenches which are dug in the peat fields. These areas of carbonized turf are many of them miles in extent. Some of the trenches are half a mile long. The peat is cut into blocks and piled in stacks to be removed later. Stacks such as those shown in the illustration consist of about 1,500 blocks each.

WASHING MACHINE HAS MANY LABOR-SAVING FEATURES

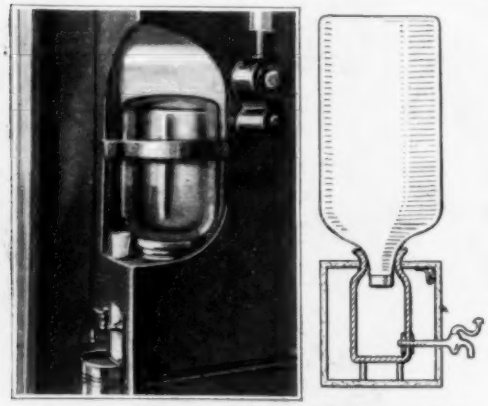
An electrically operated washing machine in which several labor-saving improvements have been embodied consists of an inclosed copper tub mounted on a steel framework and connected with a motor which gives it a rocking motion. Above it is a wringer, also operated by the motor. A gas jet can be attached under the tub to heat the water, and thereby save lifting; further economy of labor is effected by a threaded valve in the bottom of the machine to which a hose can be attached to drain water directly into the sewer. A bench long enough to hold two tubs is mounted on wheels and runs on a track set in front of the washer, making it possible to shift tubs easily. All gears are covered with metal casings.



An Electric Washing Machine in Which the Water is Heated by a Gas Jet beneath It. The Movable Bench Holds Two Tubs and Saves Much Lifting

IMPROVED DRINKING-WATER TANKS FOR CARS

The substitution of attractive, sanitary water containers for the old built-in tanks in the cars of an interurban line entering Indianapolis, Ind., has followed the adoption of sanitary drinking cups on that line. Increased patronage of the cars' fountains has demonstrated the popularity of the change. Under the old system water was cooled by placing ice in it. Now a water bottle is inverted over a chamber about which ice is packed and from which the faucet projects. The bottle is in full view and is held in a recess in the wall by a single metal band. The cost of making the change is being met by the profits from the increased sales of drinking cups displayed in a coin-operated case close by.



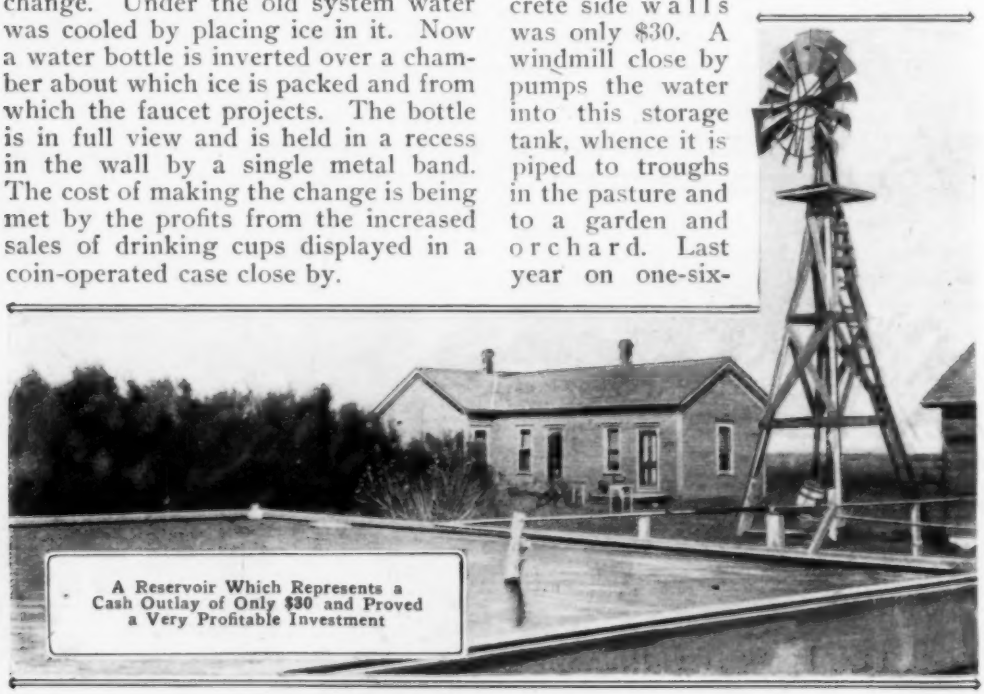
A Drinking-Water Reservoir for Railway Coaches That Is Sanitary and Requires Less Ice than the Old-Style Tanks

SOLDIERS IN TRENCHES AIDED BY RATS

It develops that the rats which have swarmed the trenches in France in increasing numbers are not an unmitigated evil. Few if any live men are ever bitten by them, soldiers declare, and they have often proven a positive aid in giving warning of the approach of deadly gas from the enemy's lines. The rats, it seems, detect the approach of gas much more readily than do humans, and when the soldiers see them showing certain signs of restlessness, they don their gas helmets.

RESERVOIR BRINGS LARGE RETURNS TO FARMER

That a water reservoir suitable for farm purposes can be built at very small cost, and that the investment can bring large returns, has been demonstrated by a farmer near Leoti, Kan., who last year built such a reservoir measuring 30 by 30 ft. and 2½ ft. deep, its capacity being over 15,000 gal. The money outlay for constructing the concrete side walls was only $30. A windmill close by pumps the water into this storage tank, whence it is piped to troughs in the pasture and to a garden and orchard. Last year on one-six-



A Reservoir Which Represents a Cash Outlay of Only $30 and Proved a Very Profitable Investment

teenth of an acre the owner raised tomatoes which he sold for $80; this was possible because he irrigated the ground. Other garden truck was produced in like proportion, including cabbages which weighed as much as 18 lb. each. Posts have been planted in this reservoir to help support and break up the ice so that it will not draw in the walls when the water is let out in winter.

SHIPPING COST LESSENED BY RHUBARB WRAPPER

A grower of large quantities of garden produce near Philadelphia, finding that the shipping of rhubarb in wooden boxes entailed what he thought was unnecessary expense, devised a wrapping machine which used paper and is said to have saved $300 in transportation charges, etc., the first season. The commonly used boxes are a source of considerable initial expense and add a good deal to the transportation and handling costs. With the new machine, sheets of paper are laid in a rack or cradle formed by two parallel supports fastened on a table. After the desired number of stalks with their leaves have been placed in the cradle, two curved iron bands, hinged at one end, are swung over the bundle, holding the paper about it while it is tied with tape. A ratchet keeps the bands in place until released. The paper keeps the stalks unsoiled and moist.

A Device with Which Rhubarb is Wrapped in Paper Instead of being Packed in Boxes

MODEL OF BATTLESHIP MADE OF SUGAR

A realistic model of a battleship, 5 ft. long, was recently constructed entirely of sugar and frosting by the chef of a California hotel. One interesting feature of this culinary achievement is that the work was done without the aid of a pattern. The ship is remarkably complete in its exterior details. A very decorative rail, to which life preservers are hung, lifeboats, flags, an eagle and shield, which served as a figurehead, and many other parts were all fashioned by hand.

Model of a Battleship Five Feet Long, Made Entirely of Sugar

TWO MOTORCYCLES JOINED TO MAKE ODD VEHICLE

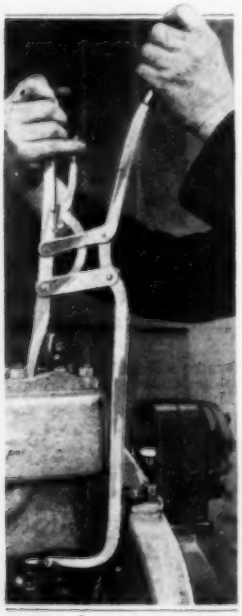
By fastening an old motorcycle alongside one with an engine powerful enough to move both at a good speed, a Columbus, Ohio, painter and decorator has constructed a novel vehicle

A Decorator's Novel and Useful Vehicle Made by Fastening Two Motorcycles Together

which he uses for business and pleasure. The two machines are held together by a frame made of gas pipes which supports a box in which brushes, paints, etc., can be carried. By using a detachable seat an additional passenger can be accommodated. Because the body interfered with the movement of the handlebars they were removed and a sprocket wheel put in their place. An automobile steering wheel and shaft, with a sprocket wheel at the lower end of the latter, were fastened beside the frame a short distance in front of the driver's seat; the two sprocket wheels were connected by a chain, thereby completing a very satisfactory steering apparatus. The front wheels were connected to operate in unison. The spark and gasoline levers were fastened to the steering wheel.

VALVE LIFTING MADE EASY BY SPRING COMPRESSOR

Quite a simple as well as convenient device for compressing the spring of a valve so that the locking pin may be removed and the stem lifted from a cylinder, has been designed for shop use and for the motor-car owner who does his own overhauling and repair work. The bearings of two connecting bars holding the arms of the instrument are so placed that the lifting lever is automatically alined with the point of the companion member which presses down upon the valve head. This removes the danger of bending or otherwise injuring the valve stem. When a valve spring has been lifted, the instrument is locked by a ratchet and pawl. This gives a mechanic free use of his hands and permits him to remove the pin without assistance. When placing a spring back in position, the washer is clamped to the lifter so that this usually tedious part of the work is completed quickly and with ease.



TO FLOOD WHOLE STATUE OF LIBERTY WITH LIGHT

The statue of Liberty, in New York harbor, is to be illuminated at night from the base of its pedestal to the top, if the campaign now being conducted by a New York daily is successful. At present the government supplies a comparatively dim light for the torch in the uplifted hand of the goddess; the proposed illumination will set off the whole colossal figure in bold relief so that it may prove even more impressive at night than it does in the daytime. A few weeks ago, for the purpose of showing what a fine effect full illumination could produce, the battleship "Michigan" turned powerful electric lights on the statue at night; the spectacle was pronounced magnificent. Donors to the illumination fund are giving large and small amounts, many children contributing their coins to the cause. The publication which is leading this movement headed a campaign 30 years ago to raise $100,000 to erect the pedestal on which the statue now stands. Gifts at that time consisted chiefly, if not entirely, in coins of 10 cents or less.

CAGES PROTECT MOTORS IN PUBLIC GARAGE

Cages, in each of which an automobile may be stored, are a new feature of the equipment of a Los Angeles garage. The big lockers are made of heavy wire netting supported by a framework of piping, a portion of which rests on casters so that, on being unlocked, the cage can be swung open to permit an automobile to enter or

Cages to Protect Motors in a Public Garage: Each Car Owner Has the Key to His Cage and So Is Sure No One Else Has Access to His Car or the Parts He may Leave Behind

depart. Each inclosed area is large enough to allow one to work without inconvenience on any part of a car within the locker. Parts locked in the cage can be left behind with safety; there is no danger of collision with motors assigned to adjoining areas. When a motorist puts up his automobile he is sure that it will remain in the garage and will not be "borrowed" by some unauthorized person.

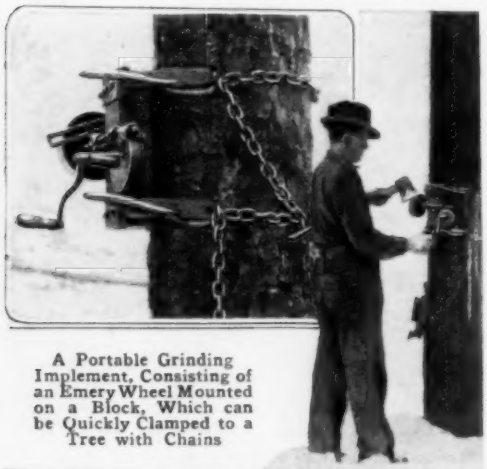
TROUSERS AND SHOES FOR TRACK ATHLETES

For the protection of track athletes when they are resting between events, a maker of athletic goods has brought out trousers of a special pattern. The ordinary track suit includes loose trunks of cotton, or other light material. This new garment is designed to be slipped on over the trunks while a runner is resting on the field. They are made of heavy worsted and extend down to the ankles, so that they have sufficient warmth to prevent the wearer's muscles from being chilled. The same maker has designed track shoes which are especially light in weight. One feature which contributes to this lightness is the thin soles, which are entirely devoid of stiffness.

Illustration Shows the Worsted Trousers Designed to be Worn over Track Trunks When an Athlete is Resting. The Track Shoes Shown Are Especially Light and Have Pliable Soles

PORTABLE TOOL SHARPENER FOR FOREST RANGERS

The demands made upon the axes of woodmen and forest rangers, particularly when fighting forest fires, often are such that they need to be resharpened during the course of the day's work. Dull axes may contribute to failure to stop a conflagration. Since it is impractical to carry an ordinary grindstone into the forests and move it from place to place, a ranger in one of the national forests in Washington has constructed a sharpening tool which is easily portable, being light and occupying small space. To a suitable block he fastened an emery wheel with the usual gearing and crank; clamps, to which chains were attached, were fastened to the block so that the device could be quickly secured to the trunk of a tree. An ax can be held against the wheel with one hand while the crank is being turned with the other.



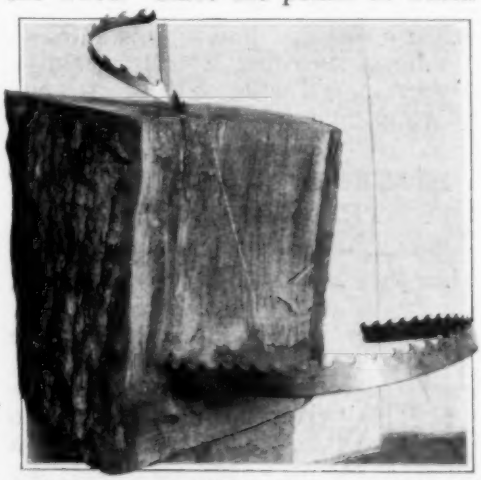
A Portable Grinding Implement, Consisting of an Emery Wheel Mounted on a Block, Which can be Quickly Clamped to a Tree with Chains

HIGH BUILDING TO JOIN ISLAND AND BRIDGE

A building, 10 stories high, is to be erected as an approach to the Queensboro bridge in New York City, according to a recent announcement. The structure will be built on Blackwell's Island, where are located a number of the city's institutions. The island can now be approached only by boat, though the bridge mentioned passes over it 140 ft. in the air. The 10-story building will serve municipal purposes and will include in its equipment freight elevators which can carry five-ton trucks from the island to the level of the bridge. When it is finished the boat service will be discontinued.

THREE FEET OF BAND SAW IMBEDDED IN LOG

The breaking of saws in sawmills is not uncommon, but the performance of a band saw in a St. Louis plant when it broke recently marked that accident as unusual. The saw, which was being used to cut a large log, snapped when it struck a spike imbedded in the wood. The band was traveling at great speed and one end of it entered the side of the log and emerged at the end several inches away. Calculations showed that the portion of the saw which had been broken off measured 8 ft. 4 in. The two ends which project from the pierced timber have a combined length of 4 ft. 8 in., which leaves 3 ft. 8 in. of saw that is imbedded in the wood. Since the points at which the band of steel entered and emerged are considerably less than 3 ft. apart, the hidden portion of the saw must be curved in the log.



A Chunk of a Log in Which is Imbedded a Piece of a Band Saw Three Feet Eight Inches Long

TREATING DISTORTED TEETH WHILE NATURE CAN HELP

Many persons go through life uselessly handicapped by obnoxious, abnormal teeth. There are few things that detract more from one's personal appearance than protruding incisors or crooked canines. Modern dental surgery obviates such malformations if given the opportunity while the jaw is still plastic so that mechanical skill and nature may work hand in hand.

An interesting example of what has been, and can be, accomplished in this field is afforded by the case of a 15-year-old girl whose front teeth were so badly misshaped that it was impossible for her to draw her lips together. This form of malocclusion is known as the V-shaped arch, a condition most often caused by thumb sucking in infancy. In less than a three-week period, a Chicago practitioner rectified the trouble, with the result that the girl, previously unattractive and devoid of expression, was given the wholesome, pleasing appearance that was her natural heritage.

The two large central teeth, one of which had been broken half off, were extracted and the two pencil-shaped lateral teeth cut off near the gum line. Nature was then allowed 15 days in which to absorb the protrusion of the dental process, which, with the big teeth, had been responsible for the deformity. A four-toothed porcelain bridge was made and fitted in place.

These Contrasting Pictures Tell the Story of What Nature and Dental Skill Did for a 15-Year-Old Girl Afflicted with a Badly Deformed Mouth

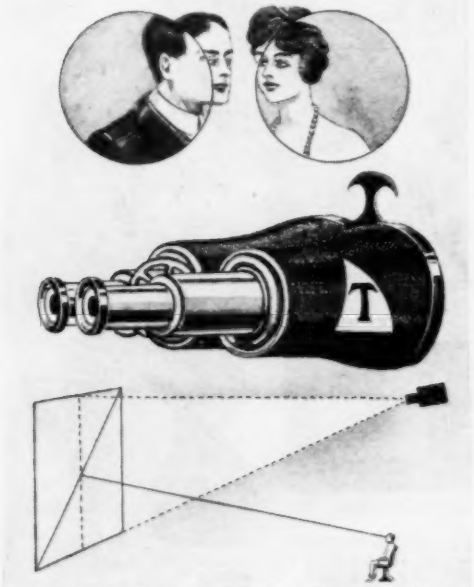
UNUSUAL WELDING JOB IN MAKING FOUR HEADERS

Equipment recently completed for the Iowa State Penitentiary at Fort Madison, Ia., included four headers, the construction of which involved a job of welding that required some uncommon operations. Each header is 25 ft. 3 in. long and is made of 5 in. pipe with standard flanges. Into each pipe one hundred 1¼-in. bosses were welded at centers 3 in. apart. The two headers shown in the illustration weigh about 1,100 pounds.

Uncommon Headers, into Each of Which One Hundred 1¼-Inch Bosses were Welded: These Two Headers Are Over 25 Feet Long, and Together Weigh About 1,100 Pounds

OPERA GLASSES TO CORRECT NEAR VIEW OF "MOVIES"

It has been estimated that the distance at which the human eye can, without unusual effort, look upon the whole of a picture is one and one-half times as great as a line drawn diagonally across the picture. This fact explains why persons in the front seats in motion-picture theaters cannot view the scenes with ease. To overcome this difficulty opera glasses, outwardly resembling ordinary binoculars, have been designed which reduce instead of magnify the view so as to make the screen seem to be the proper distance away. The glasses also are fitted with a device by which the angle of vision may be widened, enabling a person in a forward side seat to get a view that is more nearly normal and complete.

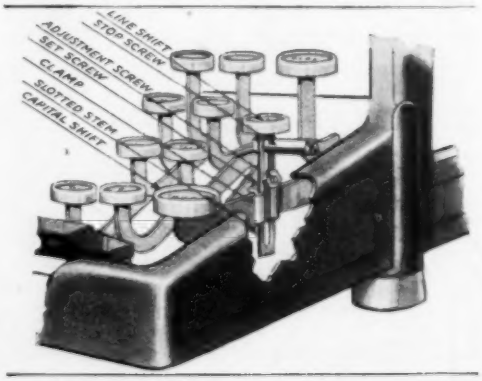


"Movie" Glasses That Reduce Instead of Magnify, as Shown in Contrasted Circles, Making a Front-Row Spectator Seem Distant from Screen: Diagram Shows Distance at Which Screen can be Viewed Easily without Glasses

¶The city of Berlin, desiring to be independent of the general market, is seriously considering the purchase of a coal mine, since it requires large quantities of coal for municipal works.

NEW SYSTEM OF SHORTHAND WRITTEN WITH TYPEWRITER

A system of writing shorthand on a typewriter which enables a stenographer to take dictation with a machine at three times the speed at which matter can be transcribed, is now being introduced into courts and business offices. The system is based on a number of rules for abbreviating words and phrases, supplemented by the manner of writing the same and such abbreviations as each person may adopt from his own experience. Vowels are represented either by the letters themselves or by the figures 5 to 9, inclusive, according to what the adjoining letters are. Letters that are printed with a bold face by striking the typewriter heavily indicate special combinations of letters, and the use of capitals likewise has special significance. In these ways the number of word and phrase signs which a typewriter can print is greatly increased, and it is still further augmented by reason of a supplementary shift key that causes any lower-case letter to be printed slightly off the line, thereby making it serve as a word or phrase sign. This key is slidably attached to the right-hand shift-key lever. An arm projecting from the side of this attachment prevents the supplementary key from being pressed down the full distance, because the arm strikes the typewriter frame, and in this way the offset

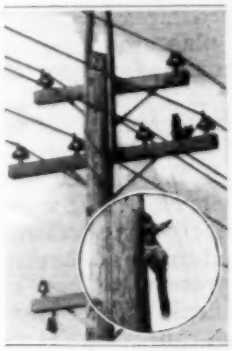


Supplementary Shift Key for Typewriter by Which Letters can be Written Slightly off the Line, Making Them Serve as Word or Phrase Signs

of the letters is produced. A few common words and endings together with their special abbreviations used in this system are as follows: have, 2; for, 4; before, b4; and, z; of, /; ion, tion, sain, etc., z. One way in which this style of shorthand surpasses that written with a pencil is that hand-formed letters often vary in size and shape, while these are uniform.

SQUIRREL CAUGHT GNAWING HIGH-TENSION TIE WIRE

After many months of mystery as to who was responsible for the cutting of aluminum tie wires on the high-tension line between the power dam at Keokuk and Burlington, Ia., an arrangement was installed which was designed to give the operator at Keokuk a warning whenever a marauder began tampering with the wires. The means of detection consisted of a small transformer installed at Keokuk between each line and the earth; in the secondary circuit of the transformer was placed a lamp which could be seen by the operator. Shortly after the installation had been made the light flashed and then went out. The operator ordered the patrolmen on the line to go out and search for the trespasser. A few hours later one of them reported that he had found a gray squirrel dead on a wet cross arm beside a gnawed tie wire. This confirmed the suspicions of the engineers, who had begun to think that the trouble was caused by the little animals, who apparently delighted to sharpen their teeth on the soft aluminum. The patrolman's photographs of the dead squirrel and of another squirrel who had mounted to a cross arm but had escaped death, are reproduced in the illustration.



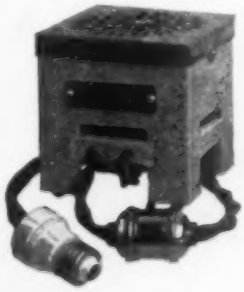
DOG DRAWS CRIPPLE IN WHEELED CHAIR

A little cripple, who has attracted the attention of thousands on the streets of Los Angeles, has solved the problem of transportation for himself, despite his infirmities, by riding in a pneumatic-wheeled chair drawn by his faithful dog. According to the cyclometer attached to the vehicle, the faithful animal had drawn his master 4,204 miles between June 12, 1913, and May 5, 1916. The chair is equipped with bicycle wheels, a comfortable high-backed seat, a warning bell, etc. When advisable a headlight and tail light are attached; a lunch box and umbrella are sometimes fastened beside the seat.

Los Angeles Cripple Whose Dog has Drawn Him in This Wheeled Chair More Than 4,200 Miles Since June, 1913

HOUSEHOLD ELECTRIC STOVE MADE OF SOAPSTONE

Soapstone and asbestos form a composition material used in the construction of a new type of electric stove for the home. The apparatus takes the place of the ordinary hot plate, and presents a unit which is sightly as well as efficient. It may be used for cooking or heating purposes and needs only to be connected with a lighting socket to be ready for service. Water



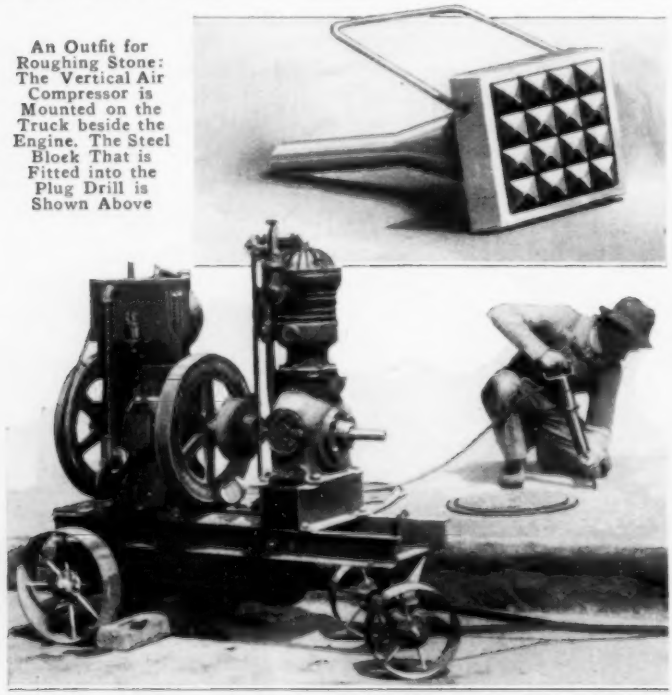
may be boiled, waffles baked, eggs prepared, bread toasted, or the temperature of a room raised in a few minutes. Thus it is equally suited for a butler's pantry, breakfast room, or an invalid's chamber. The heat is given off from the top of the stove, practically none being wasted by radiation from the sides or bottom. It is available in both black and white stone, and in different shapes. The equipment includes a heat-regulating switch of the push-button type.

BLIND SOLDIERS SUITED FOR WIRELESS JOBS

That blind persons are particularly adapted to the work of wireless operators and that such positions should be reserved as far as practical for the blind soldiers, is the recent declaration of French scientists who have been making a study of what occupations are open to men who have lost their sight in the war. It is a well-known fact that the loss of sight is generally followed by the development of a very acute sense of hearing and of touch. Such qualifications are particularly desirable in wireless operators. It has been pointed out that every ship might have not only a blind wireless telegrapher but also a blind person as an assistant in steering during a fog—a time when even experienced officers often have the greatest difficulty in determining the direction from which warning blasts come. In some cases the position of wireless operator and sound detector could be combined in one. No suggestion of charity would attach to the employment of blind soldiers in this sort of work.

COMPRESSED-AIR OUTFIT FOR ROUGHING STONE

An outfit for roughing stone sidewalks, and the like, now being used in Quincy and other Illinois towns, is operated by compressed air and can be easily moved from place to place. It consists of an air compressor coupled to a gasoline engine, the two being mounted on a light steel truck beneath which the air receiver is fastened. The compressor is a vertical air-cooled machine, having compressor valves of thin flexible sheet steel, which cannot be drawn into the cylinder. The tool operated by the compressed air is an ordinary plug drill, fitted with a case-hardened steel block having 16 sharpened raised points. The block has a wire handle which helps to guide the tool. In chipping around posts or cracks, a trimming tool is used. A device is furnished with the compressor which keeps the air at exactly the correct pressure.



An Outfit for Roughing Stone: The Vertical Air Compressor is Mounted on the Truck beside the Engine. The Steel Block That is Fitted into the Plug Drill is Shown Above

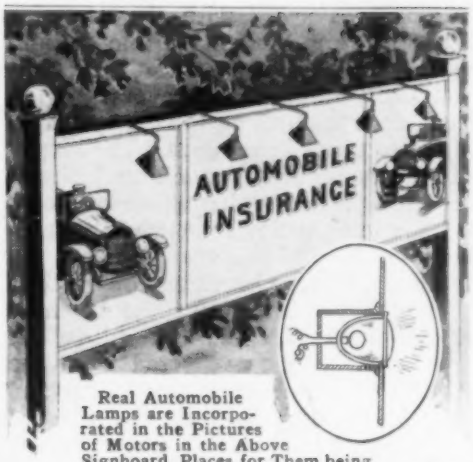
PRIVATE PHONE DIRECTORY OF CONVENIENT FORM

For both office and residence use, a practical and convenient directory of the telephone numbers one calls most frequently has been introduced. Mechanically the device is similar to an ordinary window shade. A sheet of vellum cloth, with ruled spaces for 160 separate single-line listings, is wound about a spring roller that is mounted inside of a cylindrical case attached to the standard of a desk instrument by means of a simple clamp. Listings are typewritten alphabetically. As erasures may be made without injuring the stock, it is possible to keep a list in corrected and neat form at all times. Since the device is attached to the telephone it is always in place when needed, saving one's time and being of especial service in cases of emergency. To refer to it one draws out the sheet until the number desired is visible. The tension of the spring roller pulls the strip back into the case without any effort or coaxing on the user's part.

The Device Is Always in Place and Saves the Time One Usually Wastes in Thumbing a Bulky Directory to Find a Number Frequently Called but for the Moment Forgotten

AUTO LAMPS INCORPORATED IN MOTOR-CAR SIGN

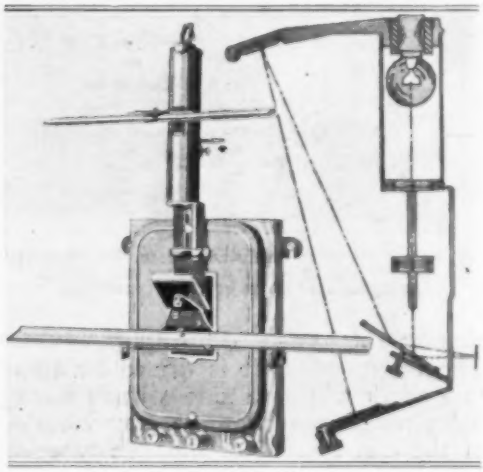
The effectiveness of a signboard in Kansas City, Mo., advertising automobile insurance, has been much increased, particularly at night, by incorporating real automobile lamps in the front-view pictures of cars which constitute a part of the display either side of the reading matter. These lamps are illuminated at intervals by the operation of commutators and contact brushes, the control being so arranged that when the shaded bracket lights in front of the sign are turned off the automobile lamps are flashed on. The vividness and novelty of the display never fails to attract attention.



Real Automobile Lamps are Incorporated in the Pictures of Motors in the Above Signboard, Places for Them being Cut in the Sign as Shown in the Insert

COMPACT GALVANOMETER LAMP AND SCALE

A combined lamp and scale has been designed to be attached to a galvanometer of a common wall type; the



A Combined Galvanometer Lamp and Scale Which Enables One to Make Readings Easily

device does away with the use of a telescope, and presents a line of light which moves along a cardboard scale and can be seen from several angles, thus often facilitating the manipulation of instruments being used. The instrument consists of a frame on which are mounted a low-voltage incandescent lamp, a lens, two mirrors, and the cardboard scale. The lamp is inclosed in a tube, below the lower end of which is a lens that concentrates the beam of light downward against an adjustable mirror; the ray is reflected from the latter to the galvanometer mirror and back to the first mirror, whence it is deflected upward to the second mirror of the device. From there the beam of light is reflected onto the scale, enabling one to make readings at a glance.

LETTERS SUPPLANTED BY PHONOGRAPH RECORDS

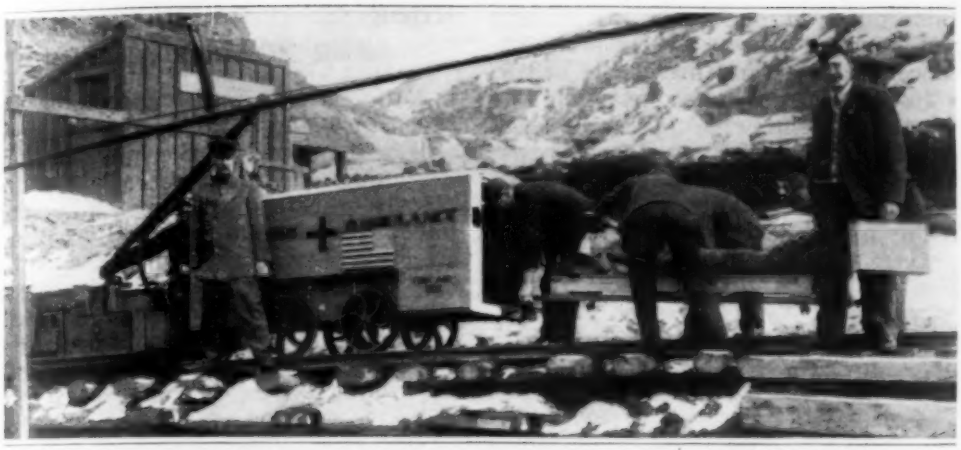
Advertising communications of a most unusual character were sent out recently to 2,500 prospective patrons by the publishers of a growing trade publication. The communications were in the form of 2,500 phonograph disks on which were recorded the message which otherwise would have been put in the form of a circular letter. It was the belief of the senders that this type of advertising would gain the attention, through its novelty, of 100 per cent of those addressed, while letters would be ignored by a large number. The message on the records contained about 175 words and set forth the salient facts about the journal's advertising power.

AUTO-DRIVEN FERRY BUILT ON NEW LINES

A number of radical changes have been made in the automobile-driven ferry which makes 20-mile trips from Aberdeen, Wash., across the bay and which was described in Popular Mechanics Magazine of August, 1915. The improved craft is driven by two propellers and two side wheels from belts which run over the rear wheels of the car, instead of the side wheels being driven directly by the car's rear wheels. This makes it possible to set the side wheels lower in the water, thereby overcoming a defect of the old ferry. In three minutes one can jack up an automobile and connect it with the belts of the new carrier. The remodeled craft travels about 12 miles an hour; it has a pointed bow, measures 16 by 34 ft., and will carry two large, or three small cars. On each side of the boat are small cabins for the accommodation of passengers in wet weather. At the right of the car driver's seat is a steering wheel.

The Remodeled Ferry Used at Aberdeen, Washington: It can Travel 12 Miles per Hour and Has a Capacity for Two Large or Three Small Cars

The Ferry is Driven by Belts Which Run Over the Automobile's Rear Wheels



Removing an Injured Miner from the Electrically Heated Ambulance Car at the Mouth of the Tunnel

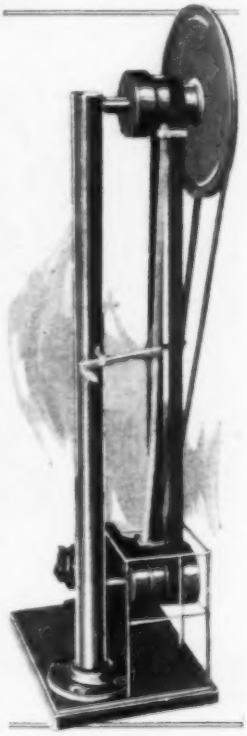
HEATED AMBULANCE IS USED IN WYOMING COAL MINE

To facilitate the speedy transportation of injured men to the surface, when accidents occur, an ambulance car has been constructed for rescue work at a large coal mine near Rock Springs, Wyo. It has an inclosed body, is electrically heated and drawn by an electric truck, and is regularly equipped with a cot suspended on springs, so that road shocks are absorbed and not imparted to the occupant. The car is about eight feet in length, weighs 425 lb., and carries a complete outfit of first-aid paraphernalia. Before this equipment was provided the removal of injured miners was fraught with difficulty, for it frequently was necessary to carry them three or four miles through the tunnels on stretchers before reaching the surface. During this trip the men often became chilled from exposure to the intake air currents of low temperature, and their recovery sometimes has been materially retarded as a result. With the ambulance it is possible to remove them in a few minutes and protect them from unnecessary jolts and cold drafts of air.

¶A grease cup has been patented which resembles a collapsible tooth-paste container and furnishes a neat package for grease.

SIMPLE BELT SHIFTER MADE FOR SHOP MACHINES

In promoting the safety-first movement in Kansas, models of a mechanical belt shifter for lathes, drills, and similar machinery are being exhibited. A clear idea of the general character of the apparatus is afforded by the accompanying illustration. Guide loops, through which the belt passes, are provided at opposite ends of the shifting bar, which is slidably held on a rod, inclined so as to be parallel with the slope of the cones. The operating lever is riveted at the middle of the longer member and on its lower edge has a series of notches which engage a retaining strap attached to the same column that holds the supporting rod. Thus by drawing



this out, or in, one notch, the shifting rod is moved over a corresponding distance. This action throws the belt to a lower step on one cone, while the edgewise spring resulting from slack causes it to force its way onto the next higher step of the opposite cone. This is possible because the countershaft is revolving while the belt is held over against the higher step by the guide loop.

OXYACETYLENE EMPLOYED IN MAKING NOVEL WELDINGS

A display of gas lamps of many varieties which has attracted much attention to a Philadelphia show window

The Branches of This Rack for Displaying Gas Lamps were Welded On with the Aid of Oxyacetylene

consists of a central gas pipe to which have been welded scores of smaller branch pipes, arranged in such a manner as to suggest a tree. The ends of these branches each supports a gas lamp of some attractive design. This intricate piece of welding was performed with the aid of oxyacetylene gas.

HUGE MOTOR-REPAIR SHOPS FOR BORDER ARMY

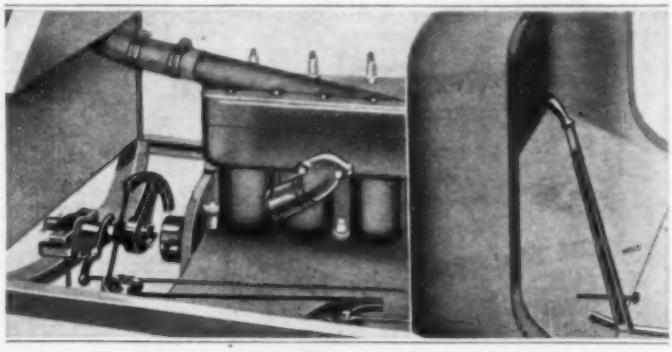
Anticipating that approximately seven thousand motor trucks and cars will be employed on the Mexican border unless conditions there take a decidedly peaceful turn, army authorities have made plans to erect at Fort Bliss, El Paso, Tex., what will probably be one of the largest automobile-repair shops in the United States. Early in July the number of trucks in use along the Rio Grande was more than a thousand, and the touring cars and roadsters employed by the army totaled about 125. Heretofore repairs have been made in the plant at Columbus and in private establishments. Some weeks ago the army asked for 2,000 more trucks, and somewhat later another 4,000 were ordered, so that the need for extensive repair works bids fair to be imperative. The equipment of the big shop at Fort Bliss will include 52 lathes.

ADULTS' NIGHT SCHOOLS FOR RURAL DISTRICTS

The state of Missouri has recently decided to follow the example of Kentucky and several other states and establish night schools for adults living in rural districts. These institutions, which have been popularly designated as "moonlight schools," offer elementary instruction in special subjects, industrial training, and in reading, writing, etc., thereby giving to the people in the country the same opportunities enjoyed by adults in many large cities. Six weeks is a common length of term in these schools. In that time many illiterate persons have been able to learn to read a local newspaper and the Bible, to write a simple letter, and to sign checks. The Daughters of the American Revolution are coöperating with the county superintendents in Missouri in establishing centers of enlightenment. This effort is regarded as one of the most promising features of the widespread movement to uplift isolated rural districts.

CRANKING DEVICE OPERATED FROM DRIVER'S SEAT

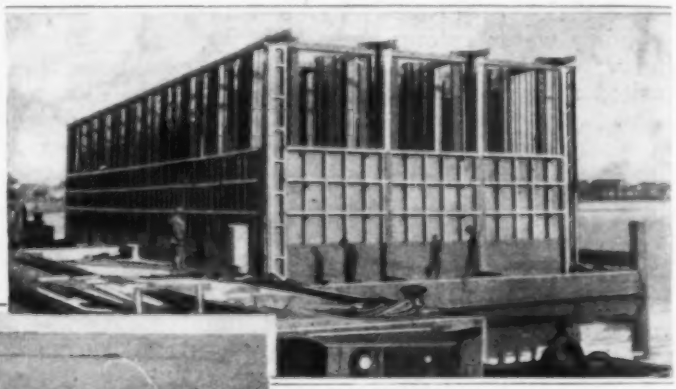
A new automobile starter, that can be attached to almost any make of car which has no self-starter, is operated by a hand lever placed within reach of the driver. A rod from the lever connects with a quadrant fastened to the frame of the car beside the engine. From this quadrant a wire cord extends forward through a pulley, and is fastened to a second quadrant imposed on the clutch which is directly in front of the engine. A sharp pull of the lever will revolve the clutch 180° or more. To engage the clutch with the crankshaft, it is necessary to press the foot against a connecting rod governing a lever, which causes the clutch to slip backward until it comes in contact with the shaft. Back-firing by the engine will disengage the clutch.



A Cranking Device, Operated from the Driver's Seat, Which can be Attached to Any Make of Motor Car

CONCRETE FOUNDATION TOWED FORTY MILES

Hollow concrete blocks, each with an average weight of 1,800 tons, are being made at a New Brunswick port; when completed they are towed 40 miles to Prince Edward Island, where they will form the foundation for a new car-ferry pier. An exposed beach and the absence of a natural harbor did not permit the work to be done at a nearer point. Three sections, or cribs, have been towed to their destination; the two tugs pulling each section could make only four miles an hour. The blocks vary in length from 90 ft. to 113 ft., are 35 ft. wide and 28 ft. deep. The cribs are reinforced from within by intersecting partitions, also of concrete. The bottoms are of British Columbia fir, thoroughly calked and treated with a coat of copper paint. After being lowered to their final position the blocks are filled with sand and rock.

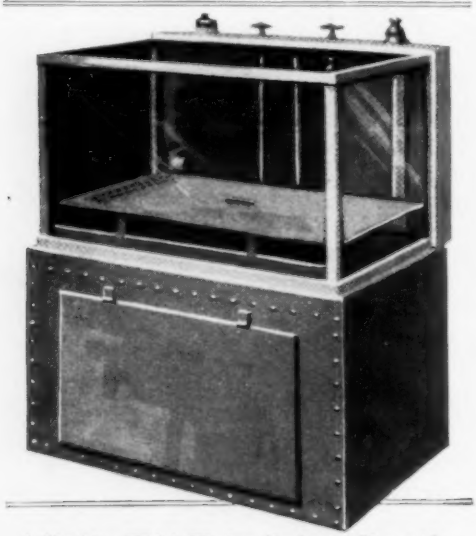


One of the 1,800-Ton Blocks at the Dry Dock Whence It was Towed 40 Miles

Beginning of a Pier, Showing Two of Its Nine Hollow Concrete Blocks in Place and a Third being Towed into Position

MACHINE WASHES FRUITS WITH BUBBLING WATER

The drudgery of washing by hand quantities of fruits and vegetables, as is necessary in hotels, canneries, etc., is



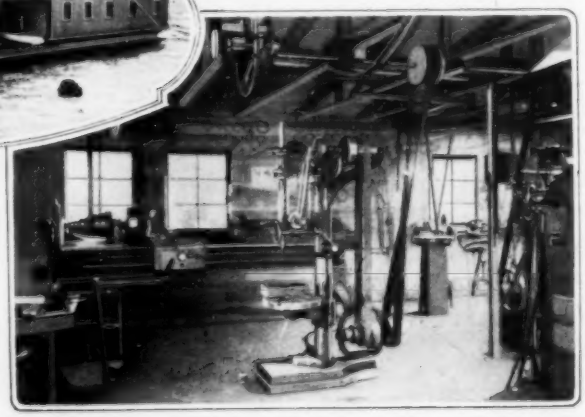
A Machine Which Washes Fruit and Vegetables, without Making Bruises or Scars, by Using Bubbling Water

eliminated by a machine which washes these articles of food by forcing bubbling water among them. Fruits and vegetables to be cleaned are deposited in a glass-walled tank having a screen bottom, below which is a perforated metal plate. Beneath this plate is a powerful circulating pump which forces streams of water up through the holes and cleanses the contents of the tank without bruising or scarring the most delicately textured. The dirt and water are carried away by side drains. The machine is made in three sizes, the smallest being 18 in. long and the largest 60 in. long.

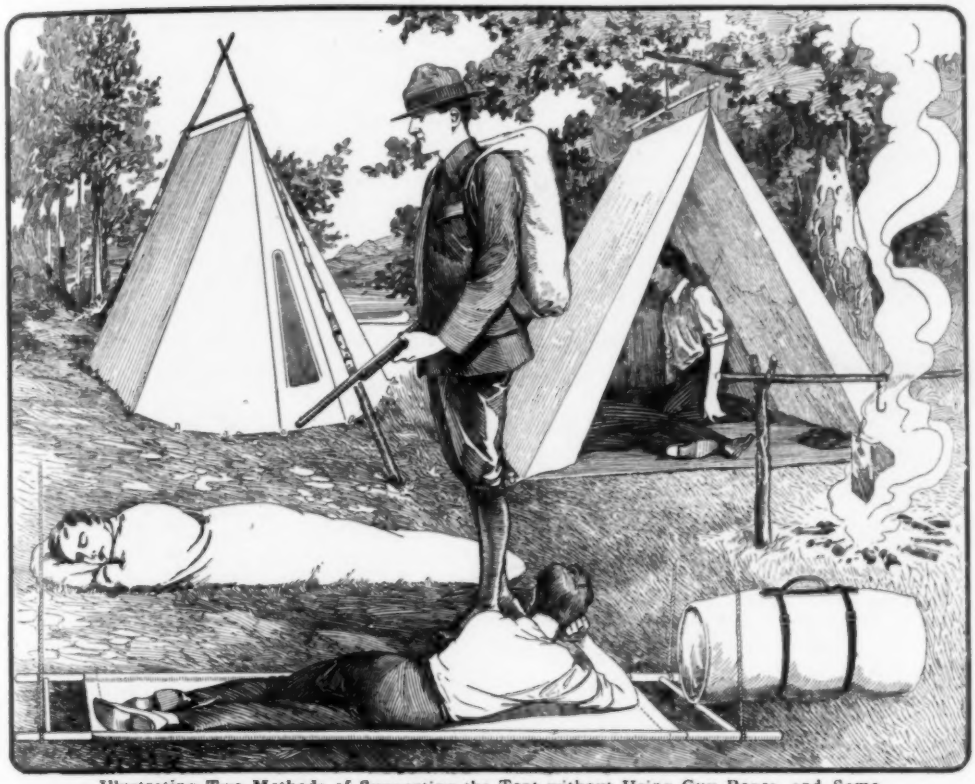
MACHINE SHOP ON PONTOONS NAVIGATES IDAHO LAKE

At one of those places where a person would least expect to find such a thing—on Lake Coeur D'Alene, in the northwestern part of Idaho—there is a floating machine shop. It was built, and is operated, by a lone mechanic and most of the year is stationed on the beach before the town of the same name as the lake. The shop occupies a part of a queer-looking boat of about 100 tons, which is 120 ft. in length and roughly 32 ft. in beam. It is constructed over twin pontoons, each 100 ft. long and 10 ft. in width. The forepart of the craft, a covered pavilion, 63 ft. long, is used for freight and storage purposes. The machine shop is back of this and takes up another 25 ft. of the boat's length, while the remainder of the deck space forms the living quarters of the owner. A stern wheel is mounted between the two pontoons and so arranged that it may be raised or lowered, thus permitting navigation in shallow water, while a 20-hp. traction engine furnishes the propulsion power and provides an average speed of about six miles an hour.

The Floating Machine Shop Tied Up at the Beach before Coeur D'Alene, Idaho



Interior of the Shop: The Machinery is Driven by a Small Gas Motor, While a Traction Engine Turns the Propeller Wheel



Illustrating Two Methods of Supporting the Tent without Using Guy Ropes, and Some of Its Convertible Features

DURABLE CONVERTIBLE TENT MEETS VARIED NEEDS

Many really convenient features for hunters, canoeists, and other devotees of outdoor life, are found in a convertible tent of distinctive pattern that is suited for both summer and winter camping. It is large enough to accommodate two persons comfortably and is made in two sections, which are interchangeable. The material is 8-oz. drill of olive-drab color. In setting the tent up, the two sections are fastened together and supported by a single jointed upright and ridge pole, with shear poles, with a rope suspended from a limb, or with a line extended between two trees. No guy ropes are needed. The sections may be converted into sleeping bags, hammocks, or litters, or each used as a poncho, waterproof cape, or a lean-to. The tent may be carried in a pack sack, or divided into two separate pieces of hand luggage. A screened ventilator section may be inserted during warm weather when flies and mosquitoes are troublesome. A 9-in. sod cloth is provided, and if it is desired, a flood cloth of the same material—fitted with devices for fastening it to the former—can be employed.

PHONOGRAPH IS INSTALLED IN TONNEAU OF CAR

Along with the fireless cooker and shower bath, the phonograph has found a place in the family motor car. An Oak Park, Ill., motorist has devised a shock-absorbing standard for a small instrument which he carries when going on evening junkets. Singular as it seems, the talking machine can be operated without missing a note while driving over average roads at a speed of 25 miles an hour. In part the stand

consists of an upright iron pipe mounted on a base that is bolted to the floor of the car. A wooden top, supplied with sides that hold the instrument in place, is secured to a spring-supported plunger that fits inside a tubing and dissipates the road jolts. The man has also devised a simple means of winding the phonograph with power supplied through a cord, or a chain, extending from the running gear of the car.

The Phonograph, Installed in the Tonneau of This Machine, is Played While the Latter is Driven

HUNDREDTHS OF A SECOND SHOWN BY STOP WATCH

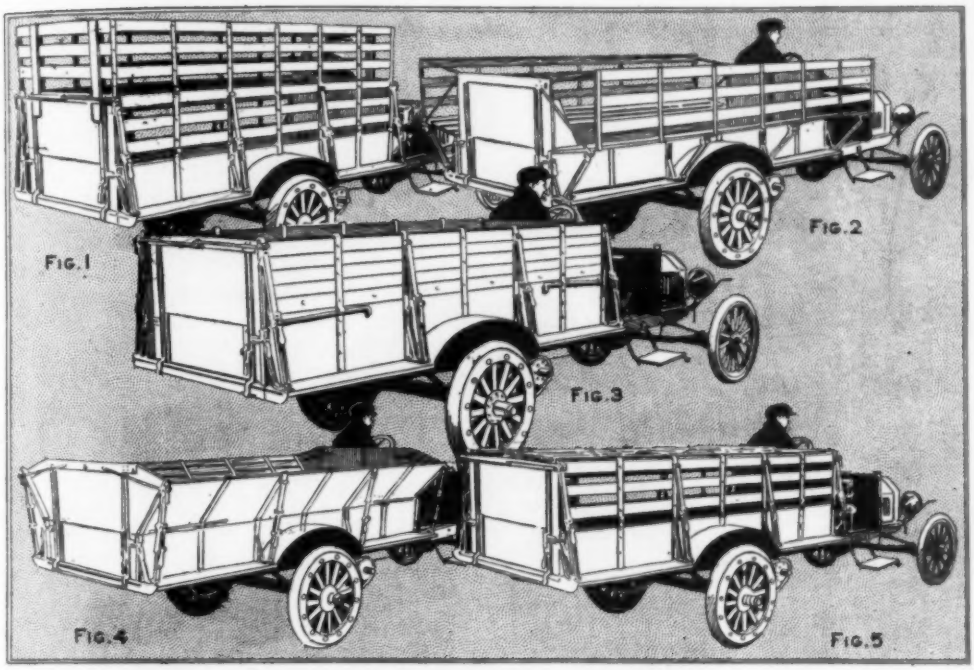
Two very delicately adjusted stop watches, one of which registers fiftieths and the other hundredths of a second, are now being manufactured for use in laboratories and in connection with the operation of motor cars, aeroplanes, motorboats, etc. A revolution of the large hand of the latter instrument requires three seconds; the dial of the other watch is divided into six seconds.

A pressure of the stem starts the hand and another pressure stops it. Each watch also has a split-second hand revolving on a dial divided into three seconds. In one case the seconds are divided into tenths and in the other into twentieths. The split-second hands being controlled by separate push pieces make it possible for each instrument to take two registrations simultaneously. These watches are 2¼ in. in diameter, and though they are made so as to be extremely accurate, they are durable and will stand ordinary usage.

BANK ACCEPTS RADIUM AS COLLATERAL

An unusual security which was recently accepted by a Chicago bank consisted of $120,000 worth of radium which was made a collateral for a four-year loan. This radium is owned by an association of physicians organized not for gain, who have acquired it with a view to ultimately making it available for therapeutic purposes in charity cases. There are nearly a dozen tubes of the valuable element in possession of the bank or under its supervision. A physician desiring to rent one or more of these vials is allowed to do so on filing a proper bond with the bank. The funds which accumulate from these rentals will be used in the purchase of additional radium; the ultimate acquisition of between $400,000 and $500,000 worth of radium is contemplated. The tubes vary in size, some containing 10 milligrams and others as high as 50 milligrams. Each consists in reality of several tubes, respectively of lead, gold, glass, etc., one within the other, to protect the radium adequately.

¶Our government's torpedo-boat destroyer "McDougal" recently established a record by maintaining a speed of 34½ miles for four consecutive hours without showing any smoke. This feat has not been equaled by any other vessel in our Atlantic torpedo flotilla.



MOTOR-TRUCK BODY THAT IS QUICKLY CONVERTIBLE

CONVERTIBLE bodies for motor trucks, while devised a number of years ago, have come into great demand since the beginning of the European war. Producers find themselves handling a greater variety of goods than ever before, and the all-purpose truck has become a necessity. The body is readily adjustable to eight different positions, five of which are shown in the accompanying illustration: Figure 1 represents a stock rack, 4 ft. high; Fig. 2 shows the same body converted into a basket rack, 6 ft. 8 in. wide; Fig. 3 illustrates the grain body having a capacity of 60 bu. of wheat; Fig. 4 shows a flared body, and Fig. 5 is an adaptation, 2 ft. 5 in. high, for hauling hogs. One person can make any one of the changes in a minute or two.

INTERNAL-COMBUSTION PUMP OF SIMPLE CONSTRUCTION

A two-cycle, direct-acting internal-combustion pump recently brought out by an English firm possesses the advantage of being light and compact in construction; the 3-in. size weighs 350 lb. and is capable of delivering 3,000 gal. an hour at a head of 33 ft. with a fuel consumption of 20 cu. ft. of gas or ⅝ pt. of gasoline. All the work is done on the upward stroke of the piston and the water in the pump circulates only on the downward motion. Assuming that the piston in the combustion cylinder is at the bottom of the stroke with a compressed charge below it, on ignition this piston is driven upward, carrying with it a cast-iron weight which is fixed to the top end of the piston rod; side rods are fixed to the weight and also to a crosshead carrying the end of the pump rod, the pump cylinder being beneath the other. The rise of the piston to a certain height operates a cam which opens an exhaust valve, relieving the pressure under the piston. However, momentum causes it to pass the ports in the cylinder which communicate with an annular chamber surrounding the upper part of the cylinder. Into this chamber the upward motion of the piston has previously compressed a charge of air and gas, which now escapes into the lower part of the cylinder. The piston returns and compresses the new charge, at the same time drawing in a new one above. To start the pump, the piston is raised by a barring lever, and a charge is allowed to accumulate beneath it. The piston is then allowed to fall, compress, and fire the charge.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

The Stone may be Removed and a Signet Plate Set in Its Place. In This Way Two Different Rings are Provided

There Is No Danger of Soiling Delicate Garments with This Electric Fluting Iron, Which is Made Ready for Use by Pressing a Button

This Self-Locking Hanger for Metal Troughs is Readily Unjointed When It Becomes Necessary to Replace the Latter

A Steam Compress That will Remain Heated for Some Time is Afforded with This Hot-Water Bag, Which Has a Pocket in Which a Moist Pad may be Fitted

Pivoted to the Comb Is a Wire Cleaner Which, When Moved Down in the Manner Indicated, Frees the Teeth from Hairs

Here Is a Dainty, Inviting Bed for the Baby, and It Folds Up Perfectly Flat so That It May be Carried Easily When One is Traveling

Attractive Nut Bowl Made of Natural Wood with Bark Left Intact. It is Fitted with Convenient Mechanical Cracker

Spring Dumb-Bells Strengthen the Fingers and Develop Muscles of Wrists and Fore-arms

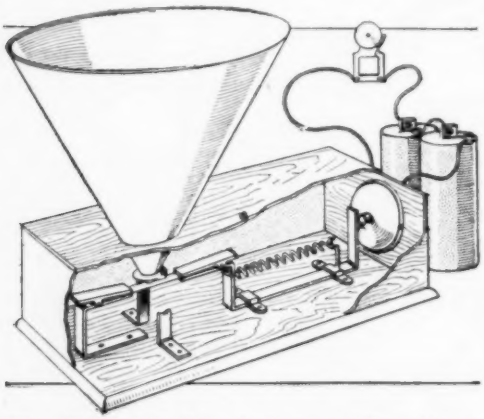
After being Placed in the Boiler, Clothes do Not Leave This Electric-Driven Machine Until They Are Ready to be Dried. There Is No Delay and No Lifting

Long Straps Fitted through Loops Make This an Adjustable Case Suitable for Toilet Articles of Any Size One may Have or Want

Toothed Lower Blade Grips Heavy Materials, Such as Linoleum and Matting, and Enables the Shears, Which Are Adjustable, to Cut Smoothly
Siphon Tube for Removing Cream from Top of Milk Bottles. The Bulb is Compressed When Cream Is Very Thick and Slow to Flow. The Device is Cleaned Easily
Decorated Clothes Hanger Suitable for Bedchamber or Sleeping Porch
This Hand Bag is Fitted with a Mirror Immediately above Which is a Small, Shaded Electric Lamp. The Latter is Extinguished by Closing the Bag
This Wire Device Holds a Cloth and Allows Windows to be Washed or Rubbed on the Outside from the Interior of a Room
Cut-Glass Salt Shaker with Lid Provided with Spiked Projections That Fit into the Perforations in Top and Prevent Them from Clogging
Large, Deep Aluminum Skillet with Removable Handle, Full Spout Lip, and a Special Meat-Browning Cover
Paring Knife That Really Cuts: The Point is Made of Tempered Steel, but the Main Cutting Edge Consists of a Safety-Razor Blade Properly Guarded
Swinging Kettle with Glass-Paneled, or Copper, Screen. It Has a Capacity of Three Pints and Is About a Foot in Height
Here Is a Suggestion for a Modest Gift: Powder Which When Thrown over Logs in a Fireplace Produces the Odd Glow of the Driftwood Flame
Silver Tongs for Oranges and Grapefruit Served in Halves. They Save the Fingers from being Soiled, and Look Neat on a Breakfast Table

ELECTRICAL DEVICE SOUNDS ALARM WHEN RAIN FALLS

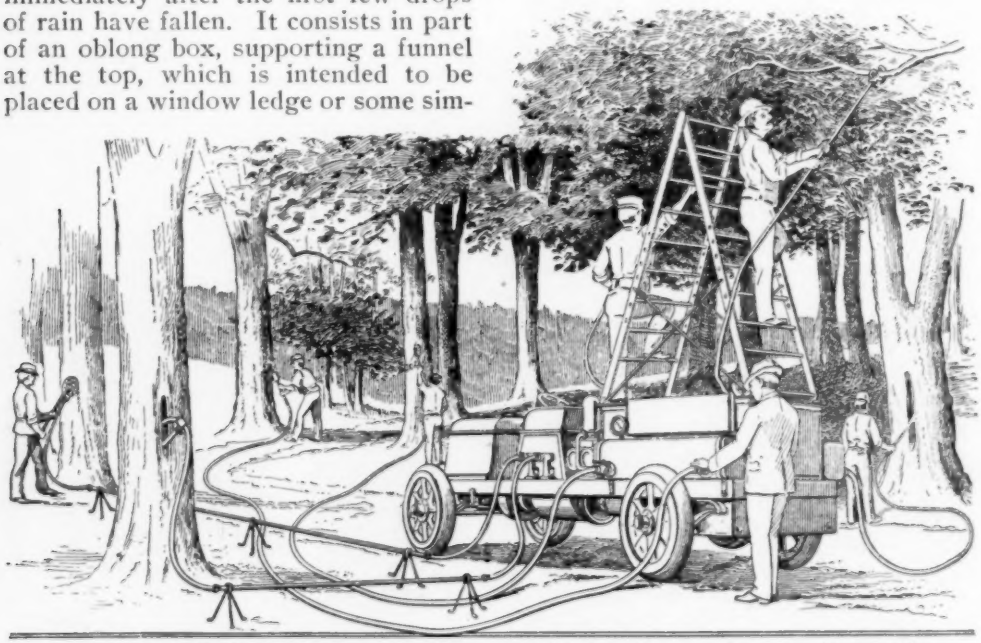
Patent rights have been granted to a St. Louis inventor who has developed a simple electrically operated rain annunciator for use in hotels, apartment buildings, and other places where windows are customarily left open for ventilating purposes. The apparatus is arranged to sound an alarm almost immediately after the first few drops of rain have fallen. It consists in part of an oblong box, supporting a funnel at the top, which is intended to be placed on a window ledge or some similar place on the exterior of a building. The lower opening of the funnel is immediately over a thin strip of paper, which is gripped at the ends by two clamps. One of these members is attached to the upturned end of a sliding bar, which is pulled upon constantly by a coil spring, so that the paper strip is always taut. Another upright member at the opposite end of the movable bar is in a position to press a switch when released. As raindrops are caught in the funnel, the water falls upon the paper ribbon. Owing to the strain imposed upon this by the spring, it breaks almost immediately, causing the sliding bar to be drawn back, an electric contact to be formed, and the alarm bell rung.



When Placed in the Open the Apparatus Gives Almost Immediate Warning When Rain Begins to Fall

CAR EQUIPPED WITH TREE SURGEON'S OUTFIT

An automobile equipped with mechanical devices by which a crew of tree surgeons can carry on all the operations of their trade, has been employed in trimming and treating certain groves in New England. The

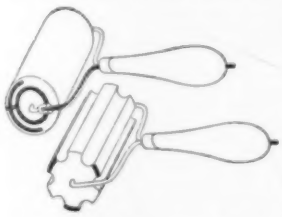


An Automobile Equipped with Several Implements Used in Tree Surgery: These are Operated by Compressed Air Procured from a Pump Driven by the Car's Motor

entire outfit is self-containing and can be moved from point to point easily and rapidly. The appliances are driven by compressed air secured from a pump operated by the automobile's motor. With this outfit several men are able to work on one or more trees at the same time. The attachments, which employ compressed air, include an air jet and a water jet for cleaning holes and depressions preparatory to filling them, a saw for cutting off heavy limbs, a pruning knife for removing lighter limbs, brushes of various sizes, and other implements.

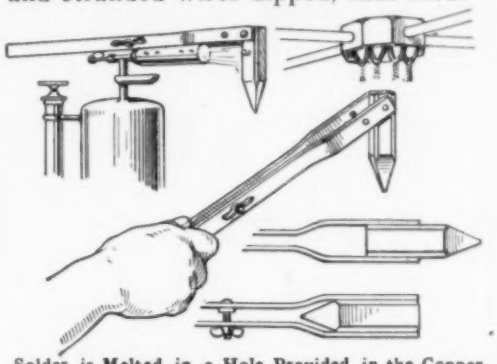
ELECTRIC-MASSAGE ROLLS OF SPECIAL DESIGNS

Two massage rollers, so designed that they will stimulate the flesh over which they are rolled by continuous or intermittent electrical contact, have been patented. The feed wires pass through the handles of both types of rollers. One cylinder is deeply corrugated, alternate ridges being nonconducting; as it revolves over the skin it produces the intermittent electrical effect. In the other type electrical connection is controlled by the position of a thumb slide at the end of the cylinder. If it is placed in contact with a ring imbedded in the end, continuous current is supplied; if it is moved so as to be in line with a semicircular band, parallel with the ring, contact is made during but half of each revolution of the roller.



MELTING POT IS MADE PART OF SOLDERING IRON

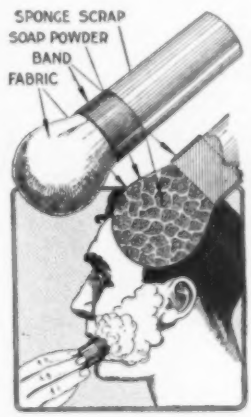
Convenient features for electrical workers are embodied in a combination soldering iron and melting pot of recent invention. A cylindrical hole, 1 in. in diameter and 2 in. deep, is bored in the copper head of the tool, which is adjustable to various angles. Solder may be melted in this receptacle and stranded wires dipped, thus insuring neat work and avoiding the danger of burning the insulation and dropping metal on rugs and floors. The same process may be followed in making splices in conduit installations. A groove along one side of the copper may also be used advantageously in certain instances. The adjustable feature makes the iron especially serviceable for switchboard work.



Solder is Melted in a Hole Provided in the Copper Head of This Iron, Which is Designed Particularly for Electrical Workers

SHAVING BRUSH THAT IS USED BUT ONCE

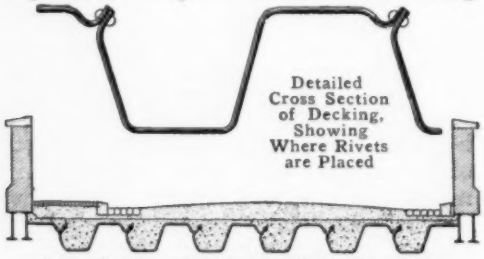
A sanitary shaving brush which is designed to be used but once and then thrown away has been patented recently. To a handle of wood, or other inexpensive material, is fastened a meshed bag, or gauze container, in which are pieces of sponge and a small amount of powdered soap. By immersing the brush in water and then applying it to the face a lather can be worked up readily. The device is designed



for use in barber shops particularly, so that each patron may have his face lathered with a brush used on no one else. Since inexpensive materials can be employed in making these brushes, they can be discarded after being used once.

NEW STEEL-TROUGH DECKING FOR BRIDGES

A new steel-trough decking, recently invented by an English engineer, possesses several features which make it especially adapted for use in building



Cross Section of Bridge in Which New Steel Decking is Used

the floor of bridges where concrete is used, and in culverts, the roofs of tunnels, etc. Common widths of the pressed-steel units range from 2 ft. 8 in. to 3½ ft. The depth of the troughs, which serve as molds for the beamlike formation of the concrete, ranges from 6 to 18 in. The riveting of the single seam for each unit can be done entirely from the upper side, the decking serving as a platform as the work proceeds. The edges that are riveted do not overlap in the ordinary way, but each is made into a shoulder; these are placed side by side for riveting. This form of seam prevents leakage of water through the floor or roof, as sometimes happens in ordinary overlapping joints. For roofing over subways, tunnels, etc., the decking can be reversed, the heading being concreted and packed as the covering proceeds; being reversed, it can be riveted from the under side. This material lends itself readily to longitudinal-sleeper construction in railway bridges, there being no projecting parts or rivet heads that interfere with placing the beams in proper position.

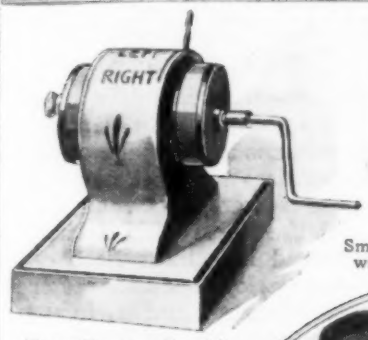
VAST AMOUNT OF CATTLE FEED WASTED YEARLY

The annual waste in this country of certain foods available for cattle totals more than $100,000,000, according to recent estimates made by the Department of Agriculture. This loss is chiefly in the form of grain straw and corn stover, which might profitably be mixed with concentrated foods such as cottonseed meal or cake, corn, molasses, peanuts, or beans, thereby making an excellent winter feed for cattle. Investigation shows that these products are much more highly appreciated in Europe than in this country. The annual straw crop is estimated at 120,000,000 tons, only two-thirds of which is put to its best use, namely live-stock production; 15 per cent of the crop is burned. The production of corn stover is about twice that of grain straw, and while 81 per cent of it is fed to stock, the amount wasted is astonishing. About four per cent is burned and a great deal more is wasted by using the leaves only.

NEW SURGICAL INSTRUMENTS NOT AFFECTED BY MAGNETS

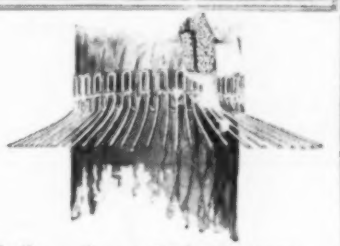
A French professor of medical electricity has recently caused to be made certain surgical instruments which are not attracted by and do not vibrate in the presence of electromagnets as do ordinary instruments, which they resemble in other respects. This peculiar property makes it possible to use the instruments in connection with a special electrovibrator which is employed in extracting projectiles from wounds. One of the serious inconveniences which surgeons have heretofore experienced in operating with the electrovibrator has been that it has been necessary to discard forceps as an aid in separating the lips of a wound while exploring it. It was found that even nonmagnetic metals, such as copper and silver, were subject to vibration and hence might cause a costly error. The new instruments are described as being made of a steel alloy.

THE CHILDREN'S PAGE OF NEW IDEAS



Every Boy can Furnish His Own Power with This Hand Motor That can be Reversed While Running

Small Coins are Saved More Easily with This Handy Pocket Bank



Cats or Squirrels cannot Molest Birds in a Tree Protected with This Wire Guard

Two of 50 Little Police Girls Who Now Help New York's Big Policemen to Keep Order in the Playgrounds, to Enforce Sanitary Rules, and in Many Other Ways

A Brilliant Electric Lantern for Use in a Boys' Camp or for Scouting

The Baby's Jumper can be Hung in Any Doorway with This Tonglike Device

Small-Sized Caddy Bag and Golf Sticks for the Young Golfer

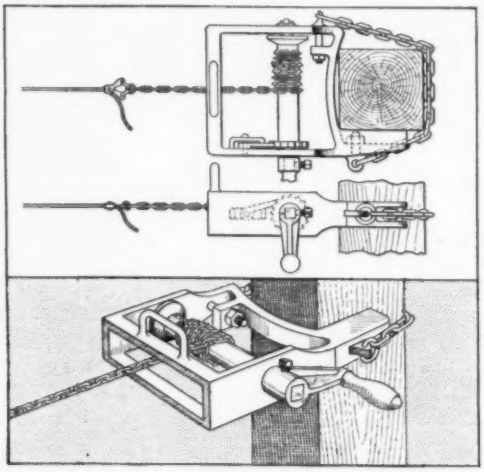
A Soft 14-Inch Ball for the Play Room: Raised Seams Protect the Stitching from Wear

Beads, Scissors, Pencils, a Bubble Blower, and a Printing Outfit Make This Little Worktable and Chair Attractive

A Liquid Gun, without Any Breakable Rubber Parts, That Throws Water 25 Feet

WIRE STRETCHER CAN BE EASILY ADJUSTED

An improved fence-wire stretcher has been designed which an operator can adjust as to position with one hand,



A Wire Stretcher Which can be Held in Place with One Hand While the Preliminary Winding is being Done with the Other

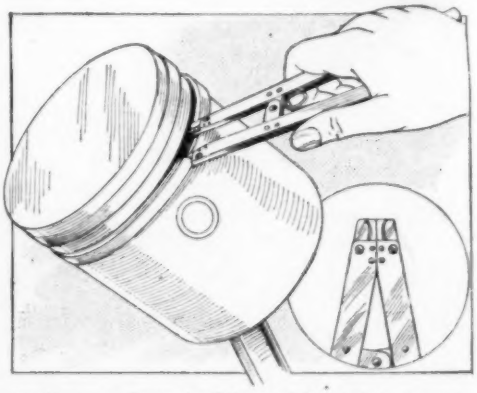
while with the other he is rotating the drum on which the wire is wound. The drum is supported by a rectangular iron frame, one side of which is slightly concave; an adjacent side projects at a right angle to the curved side, thereby forming a recess which is designed to be fitted against the fence post to which wires are to be stapled. By means of a chain suitably attached to the frame the machine is firmly anchored to the post. The drum, which is turned by a crank, has a toothed head, which, with a pawl, prevents its rotation backward. Wires to be tightened are fastened to a chain which extends through a slot in the side of the frame and is fastened to the drum. Extending upward from the side of the frame normally farthest from the post is a handle with which the position of the stretcher can be shifted as desired during preliminary winding. For work close to the ground the crank handle may be removed and the drum revolved by use of a bar inserted successively in holes in the drum's axle.

NURSERY PLANTS DISPLAYED IN SOIL BESIDE DITCHES

A new and very effective way of advertising nursery stock is utilized by an Ohio nurseryman who plants young trees and shrubs in the ridge of the dirt piles thrown up by workmen digging ditches for sewers, gas mains, water pipes, and the like. This enterprising merchant and his clerks keep on the lookout for work of such character that is favorably located, and when there is a good opportunity, they secure permission from the city authorities to set the plants in the loose soil. Each one is marked as to name and price. An arrangement is generally made with one of the gang of workmen or with a near-by shopkeeper to sell the plants on commission.

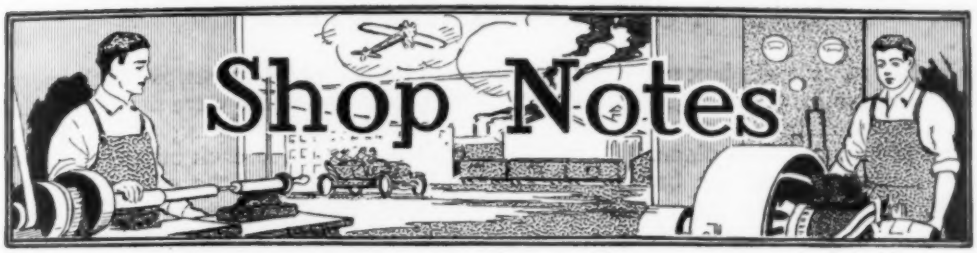
PISTON-RING REMOVER IS AID TO MACHINISTS

Getting piston rings into and out of place on automobile engines is sometimes attended with difficulties. The rings fit so snugly in their respective grooves that it is hard to obtain a tight enough grip to force them loose. A new tool expands the rings at the lap joint, causing them to spring out of place easily. Shaped like a pair of tongs, the tool is equipped with spe-



By Gripping It at the Joint and Expanding It, the Tool Facilitates the Removal of a Piston Ring

cial jaws which fit readily over the lap in the ring, insuring a positive hold during expanding operations.

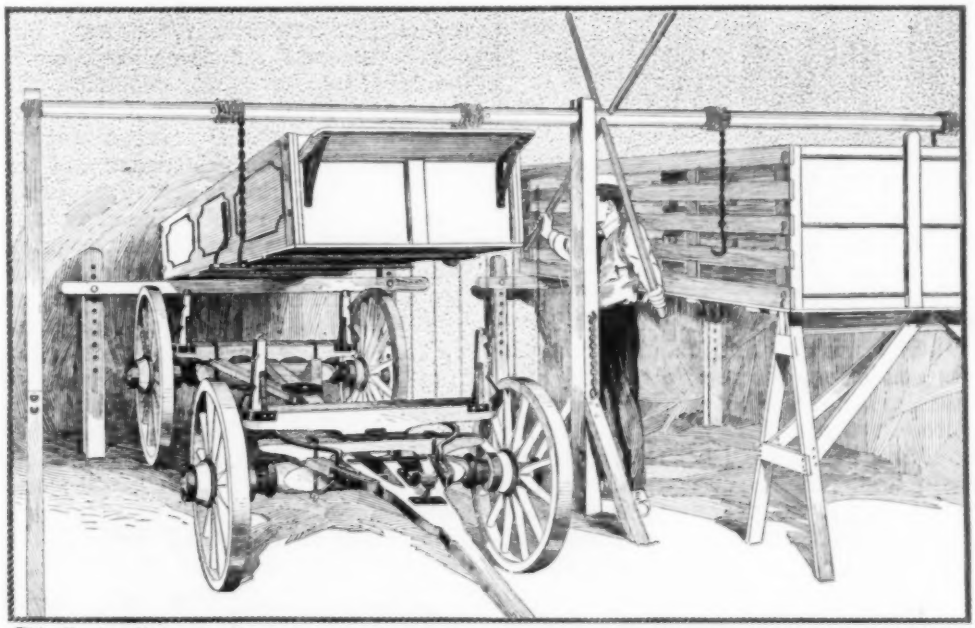


Windlass for Raising Wagon Boxes

By A. S. THOMAS

REMOVING boxes or racks from the trucks of a wagon is difficult for one person unaided, and even though he may have assistance in the operation, the unused box or rack is cumbersome to store or replace on the trucks. The lifting rigging shown in the sketch was built to make the lifting by one man convenient, and it also provides a good storage, as well as an easy means of replacing the box on the vehicle. The device has saved me much time on the farm and has prevented damage to wagon boxes, which frequently results from removing and replacing them. The device shown is fitted into a wagon shed, but it may be adapted to outdoor use, and the shaft, which carries the chains, may even be built to extend inside as well as outside of a roofed-over area.

The operation of the windlass is simple. The chain shaft is supported on posts, well braced at the ground. Chains are hooked to the sides of the wagon box, and by means of the cross arms the box is raised and its rear end supported on the adjustable bar. To hold the chain shaft from revolving when the operator releases the cross arms under load, the short chain on the shaft support is hooked around one of the arms. The truck is drawn out of the shed and the front end of the box is supported by a horse, as shown at the right in the sketch. When it is de-



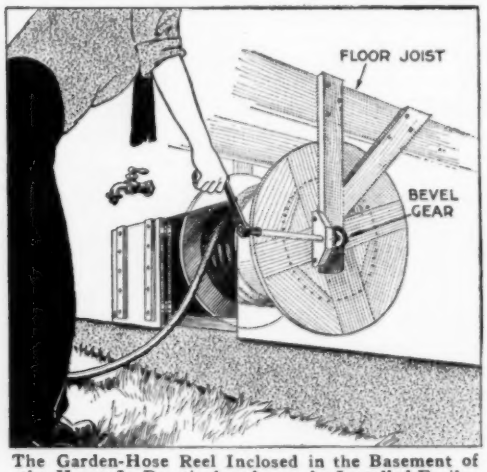
This Device Makes It Convenient for One Man to Remove or Replace the Boxes or Bodies of Vehicles, the Trucks of Which are Used Interchangeably

sired to replace the box upon the truck, the former is again raised, the horse at the front end is removed, and the box is lowered into place.

In wagon sheds or barns that are strongly built, the chain shaft may be suspended from the framing, but it is best to make certain that the load may be carried safely, additional braces being inserted as a precaution. The device may be made of a length suitable to various storage places for vehicles, and may be adapted to automobiles, trucks, or other vehicles on which the trucks and running gear are used interchangeably with several bodies.

Garden-Hose Reel Inclosed in Wall Cupboard

The sketch shows a garden-hose reel which I fitted into my bungalow and which has given much satisfaction as a practical means of caring for the hose. When I wish to use it I merely open the small door in the side of the house and draw out the hose. Replacing the hose on the reel is accomplished by applying the crank to the shaft in the wall, and, when out of the way, the small door is padlocked. This is much better than leaving the hose unreeled or rolling it on a reel of the portable type.



The Garden-Hose Reel Inclosed in the Basement of the House Is Practical and may be Installed Easily

The construction of the reel device and fittings is simple. The reel proper was built up of 4-in. strips for the core, and the round ends were made of 7/8-in. stock, the pieces being nailed crosswise, to reinforce each other. A bevel gear was fitted to the center shaft of the reel, and this engages another bevel gear, the shaft of which extends outside of the basement wall as shown. Its outer end is squared to fit the crank. The reel is supported from the floor joists of the first floor by two brackets, built up of 2 by 4-in. stock and spiked to the joists. The door was cut in the side of the house, and the piece cut out reinforced with cleats. This made it unnecessary to attempt matching paint on the door with that on the house, and made the reel opening quite inconspicuous. The opening was conveniently placed close to the water connection, making it unnecessary to drag the hose considerable distances on the lawn.—S. O. Safholm, Sacramento, California.

Inexpensive Lantern Slides for Advertising

Slides for projecting advertising upon motion-picture screens, or from projection lanterns, may be made with a clean-cut type face as follows: The advertisement is set up on the linotype machine, or by hand, centering the lines on the linotype slug, if that form is used. A proof of the matter is taken on tissue or onion-skin paper and the ink is applied rather heavily. Clean the glass slide on which the copy is to be mounted, and as soon as the proof is made, place the paper, printed side down, on the slide, holding it firmly so that it will not slip. Rub the paper with the fingers gently to transfer the ink. With a knife blade, or piece of heavy paper, curved in the shape of a scoop, cover the surface of the glass with pulverized dragon's blood. This may be purchased at the drug store, and 25 cents' worth will provide for a large number of slides. Remove the excess powder from the glass by tapping it gently, permitting the dragon's blood to drop into its container.

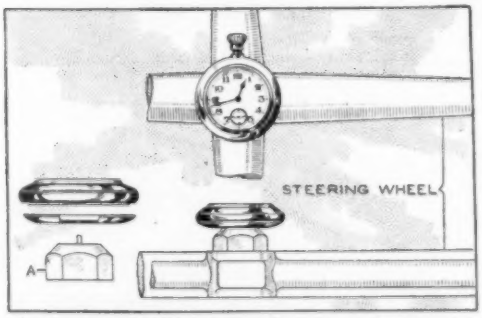
The letters transferred to the glass

will be sharply outlined by the powder adhering to the printer's ink. Pass the glass, printed side down, over a heated stove until the powder adhering to the letters turns a dark red, or black. When the imprint is dry the slide is ready for use.

Where many slides are to be made, this method will be found quite convenient. If it is difficult to have the matter set up in type, it may be worth while to purchase a set of rubber type which may be used in the same manner as the metal type. By the use of ground glass, with the printing on the ground side, an effective slide may be made. The edges of the letters will appear ragged and when thrown on the screen this gives the effect of being in relief.—Frank Kavanaugh, Atchison, Kansas.

Watch Fitted to Automobile Steering Post

To fill the need for an automobile timepiece, the method of attaching an inexpensive watch to the top of the steering post, as shown in the sketch, was devised. The back plate of the watch was removed and a hole drilled through its center. A pin to fit the hole was riveted into the nut A, which held the steering wheel in place. The back was riveted on top of the nut and the watch was screwed to the back. This simple method of fastening

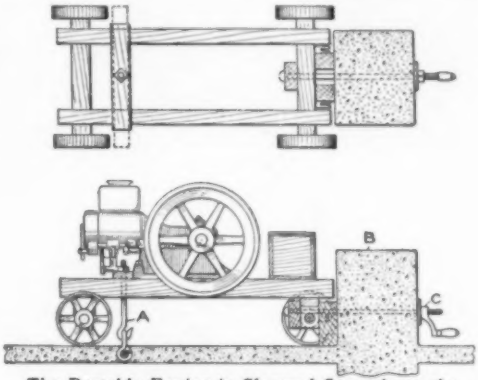


The Back of the Watch was Riveted to the Steering Post and the Watch Screwed into Place

proved satisfactory, and since the watch was a cheap one, it was not likely to be stolen.—Richard H. Jehlicka, Worcester, Mass.

Solid Foundation for a Portable Engine

Varied service demanded of a gasoline engine required that it be mounted upon a truck so that it could be readily transported. This arrangement did



The Portable Engine is Clamped Securely to the Concrete Foundation and Is Stable under Heavy Strain

not, however, render the engine stable enough for very heavy duty in a shop, and the concrete foundation and clamping device shown was arranged to secure the truck. The truck is drawn against the block B, and clamped in the hook and eye at A. The eye is fixed in the floor and swings on a rod imbedded in the concrete. The hook A is fastened by means of a nut at its upper end. The axle of the truck nearest the block B is clamped behind a pivoted wooden block, which is drawn up securely by the threaded bolt and crank C. If properly adjusted, this arrangement holds the engine firmly enough for heavy duty and long belt connection to the driving pulley.—B. Hanson, Martin, Ohio.

Trouble Lamp Operated by Dry Batteries

Dry batteries, testing eight amperes, or less, will operate small electric-light bulbs and doorbells satisfactorily. Four cells wired in series to any desired length of cotton drop cord terminating in a miniature pull socket, that is equipped with a six-volt lamp, will provide a good trouble light for a considerable period.

Rigging for Surface-Grinding Taper Cylinders

Several barrels of malleable-iron castings were returned to a foundry by a customer because they were not

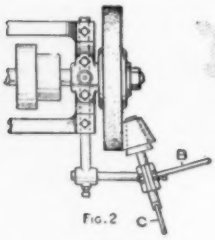


FIG. 2

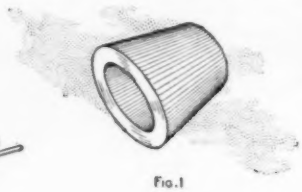


FIG. 1

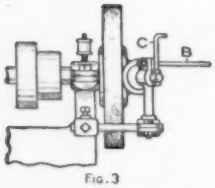


FIG. 3

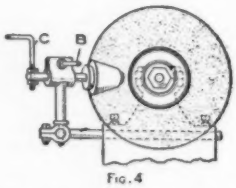


FIG. 4

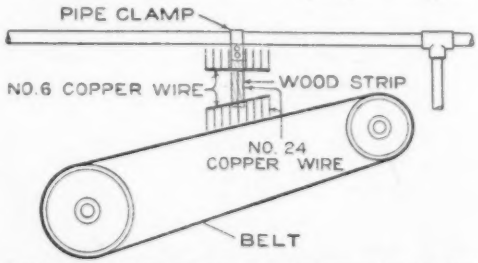
Grinding Malleable Castings to a Smooth Finish was Resorted to with Success After a Large Number were Spoiled in Attempting to Finish Them by a Rolling Process. The Device Viewed from Above is Shown in Fig. 2; from the Front, in Fig. 3, and from the Side, in Fig. 4

as smooth on the outer surface as desired. A detail of the castings is shown in Fig. 1. The foundry's repair shop was not equipped with surface grinders to finish castings, and could not handle the work. Rolling down the roughness on a lathe was attempted, by turning and threading a piece of stock to screw on the spindle in place of a chuck, with a mandrel projecting to take the castings. A roll was fixed in the tool post and fed against the casting on the mandrel, while rotating. The castings were spoiled, rejected by the customer, and new ones made.

Grinding off the roughness on an ordinary grinder, rigged as shown by the sketch, proved successful and economical. Three rest arms, two bolts, three collars, a piece of cold-rolled steel, with a sleeve driven on one end, were assembled and the castings fastened on the sleeve by a slight pressure. They were then swung against the emery wheel by means of the handle, B, with the right hand, and two turns of handle C, with the left hand, were sufficient to give the desired finish and smoothness. The first method required 25 hours for installation and the second three hours. The castings were stretched and ruined by the rolling method, and were unharmed by the second method. Time was saved in the grinding process, and it was adapted with success for other work of this type.—Stephen Bona, Union City, Conn.

Counteracting Static Electricity in Belts

Much difficulty was experienced in overcoming static electricity in belts and machinery in a large manufacturing plant. Grounding in the ordinary way proved useless and after numerous experiments the device shown in the sketch was installed and overcame the trouble completely. Two pieces of No. 6 copper wire, 14 in. long, were soldered to 12 prongs of No. 24 copper wire, 3 in. long and 1 in. apart. The resulting device appears like a comb, as shown in the illustration. One of the "combs" was fastened above the belt, as indicated, and the other was placed beneath a water pipe, or other grounded metal, so that the prongs came within 1/16 in. of the pipe or metal. Care must be taken that the combs do not touch the pipe or metal, or belt. The two combs were connected with a No. 24 wire, supported on a piece of wood, about 1 in. square and of proper length.



Static Electricity in Belts was Overcome by the Use of the Wire Combs Shown in the Sketch

The device may be used on various types of belts, providing a metal pipe or other medium for grounding the static electricity properly is available.—Samuel Baker, Toronto, Ont.

[The author of this article is a banker, who makes electrical work and mechanics his recreation. He wired up his mountain cottage for electric lights, designed a hydroelectric plant to provide energy, and built it with the aid of a mechanic.—Editor.]

CURRENT developed by a small hydroelectric plant, installed on Big Thompson Creek, nine miles below Estes Park, Col., is used to light a mountain cottage, one of a group at a delightful spot called "Sylvania." The water wheel, connecting rigging, and a dynamo are supported on a wooden frame suspended under a private bridge across the stream from the cottagers' camp to the Estes Park road. The illustration shows the general arrangement of the various parts, as well as details of the construction. Cables conducted to the cottage permit easy control of the plant without going out of doors. Old material, gathered in machine shops, was largely used in the construction, and the cost was thus kept down to about $100. The plant is in use its second season, and has given complete satisfaction. When the cottage is unoccupied, the driving belt is removed from the dynamo, the frame is padlocked up to the bridge, and the dynamo house is locked, little opportunity for molestation being afforded. As the plant is on the main road to the Rocky Mountain National Park—Estes Park—it attracts considerable attention from tourists passing by.

The swiftly running mountain stream, operating directly on a water wheel, without a dam, flume, or headgate, furnishes the power. The device adjusts itself throughout the season to the varying height of the water and to the changes in the velocity of the stream. When the device is not in operation it is drawn up under the bridge by means of the cables, which are conducted to the cabin by a series of pulleys, as shown in the illustration, and wound on a windlass shaft, which projects from the side of the house and is operated by a crank on the inside. The crank and its pawl wheel are shown in the photograph reproduced at the left, in the illustration. When light is desired, the cable is wound from the windlass, releasing the supporting frame and permitting it to pivot downward on the eyebolts supporting it. The water wheel comes into contact with the stream and is lowered until the proper flow of current is generated. This is determined by the voltmeter installed above the windlass in the cottage, as indicated in the illustration. The proper height is maintained by setting the pawl wheel on the windlass, when the voltmeter registers a current of 110 volts. A rheostat was installed, but it was found that it was not needed to control the current flow, for, when the water is high and swift, the water wheel is let down in the stream only slightly.

The lights flickered when the plant was first put into use, but this defect was overcome entirely by installing a flywheel, taken from an old ice-cream freezer. It was carefully balanced and fixed on the shaft of the dynamo. Loose-rock jetties were thrown into the stream, above the bridge, to divert

a strong current against the wheel in low-water periods. At higher stages these low rock dams permit the water to pass over them and the wheel still has a strong current to turn it.

The mechanical details are shown clearly in the sectional view, Fig. 3, at the bottom of the illustration. A wooden frame forms the main support of the mechanism, and is built up of 2 by 12-in. planks; it is about 17 ft. long and 6 ft. wide. Two eyebolts, fixed through the upstream stringer of the bridge, furnish the support for the frame, which is connected to them by means of iron straps. The frame pivots on the eyebolt joint, permitting the water wheel to be raised and lowered easily, by the change in the water level or by means of the cable and windlass. The water wheel is hung in the downstream end of the frame, while the upper end carries a small house, about as large as a dog kennel, which contains the dynamo, gears, and connecting belt. The top, sides, and bottom of the dynamo house are constructed of tongue-and-groove flooring, and the roof is further protected by a sheet of composition roofing. The lower end of the frame is turned up at an angle so that the water wheel will have a good clearance when the frame is drawn up against the bridge.

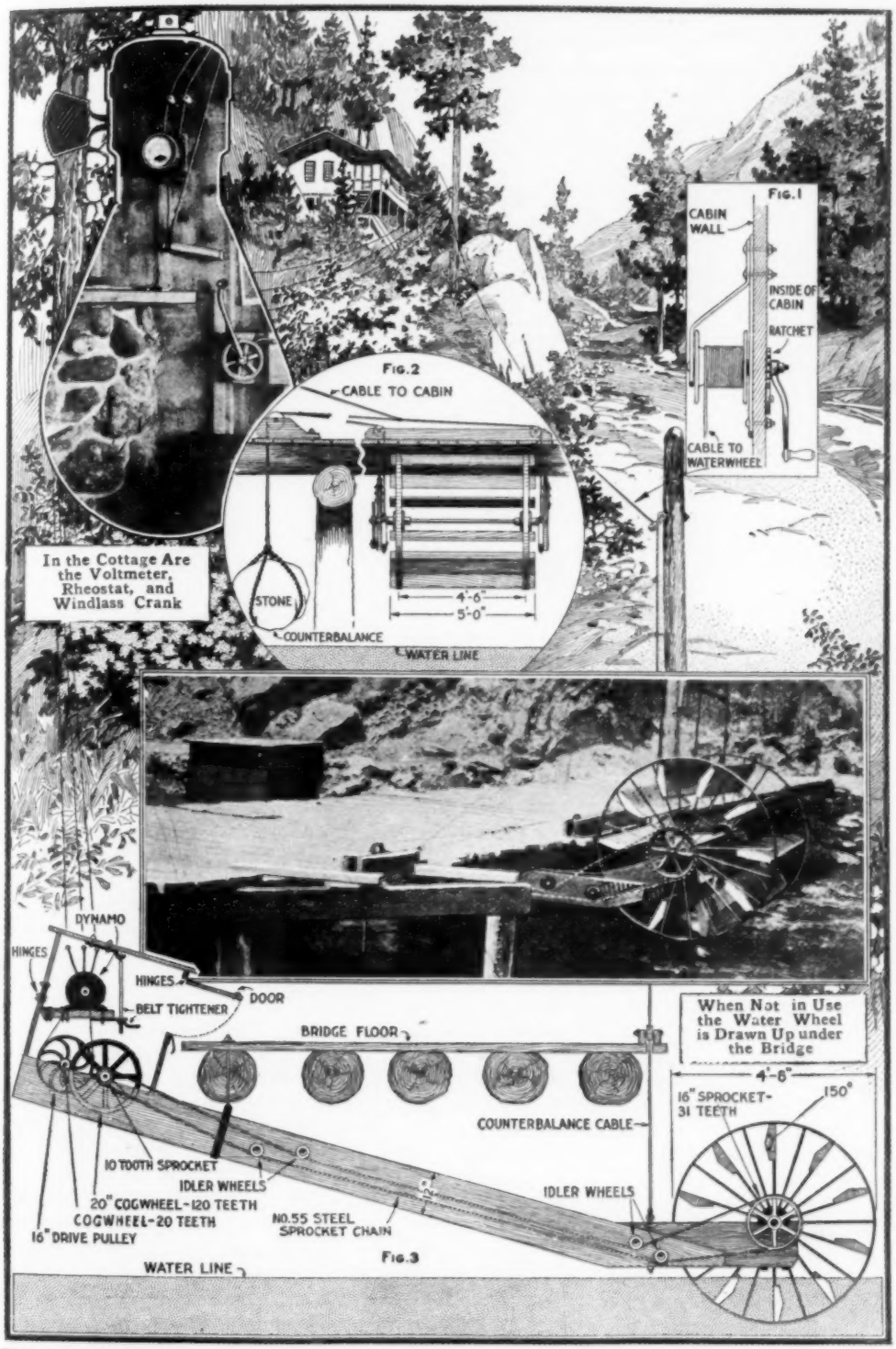
The water wheel is built of two iron wheels, from a discarded hay rake, 4 ft. 8 in. in diameter, each wheel containing 20 spokes. These rake wheels are fastened to a steel shaft, 4½ ft. apart, with the corresponding spokes opposite, and paddles are bolted to every other spoke around the wheels, making 10 paddles in all. Each paddle is 5 ft. long, and consists of two 1 by 6-in. boards, joined at an angle of 150°. The boards are held in this position by ¼-in. iron straps, bent to that angle, and the ends are partly inclosed by heavy galvanized-iron braces, shaped to fit the angle.

At the end of the wheel shaft is attached a 16-in. sprocket wheel having 31 teeth. A No. 55 steel sprocket chain, held in position and steadied by four idlers, transmits the power of the wheel along the side of the frame to a 10-tooth sprocket wheel at the outside end of the shaft, nearest the water wheel, in the dynamo house. Inside the dynamo house, a 20-in. cogwheel, with 120 teeth, is fixed to this shaft and meshes with a small pinion having 20 teeth, and set on a countershaft, giving a gear ratio of 6 to 1. At one end of the countershaft is fastened a 16-in. drive pulley, which drives the dynamo by means of a 2-in. flat belt.

The support for the dynamo consists of a piece of 2 by 12-in. plank, 20 in. long, fastened at one end to the upstream side of the dynamo house by heavy strap hinges, secured by bolts. A heavy piece of flat iron, with a ¾-in. hole near the end, projects from the under side of the plank at the other end. A ⅝-in. bolt, hung to a stout hook in the roof by means of an eye, is threaded at the lower end and projects through the hole in the iron fixture at the end of the dynamo platform. A lever nut, at the lower end of the bolt, supports the end of the dynamo platform, and provides a convenient means to tighten the belt. The dynamo is bolted to the platform.

The dynamo has a capacity of about 200 watts and generates direct current at 110 volts. It carries a small pulley, a little less than 2 in. in diameter, and the water wheel, with a working speed of about 11 revolutions per minute, drives the dynamo, through the intermediate gears, about 1,800 R.P.M.

Two eyebolts, one in each side of the frame near the water wheel, are placed nearly in line with the downstream edge of the bridge. Two steel cables are fastened to them and pass up over two grooved wheels, directly above, on top of the bridge planking and lined up with the edge of the bridge. These cables are spliced together, as shown in Fig. 2, and one cable, about 90 ft. long, runs over three pulleys to a windlass, which is installed in the cabin. Another cable, spliced to this cable and pulling in line with it, passes over a pulley at the end of the bridge and supports a heavy rock, which is used as a counterweight.



This Small Hydroelectric Plant, Built on a Mountain Stream from Materials Costing $100, Provides Electricity for the Lighting of a Cottage. The Swift Current is Always Available, and the Water Wheel is Lowered Only When Energy is Desired

The weight of the dynamo house and its machinery partly balances the weight of the water wheel at the other end of the frame. The counterweight further balances the weight of the water wheel, but is not intended to overcome it entirely, as this would raise the wheel in use. The crank of the windlass is inside the cabin, in the living room, as shown in the photograph reproduced at the left, but the shaft projects outside the cabin, and carries an iron spool, about 2½ in. in diameter, on which the control cable is wound.

Two line wires, and an additional wire for the rheostat, are run from the dynamo to the cabin. A voltmeter, a rheostat (the latter a simple resistance coil with a sliding contact) and a combined three-pole knife switch and fuse block are installed in the living room near the windlass. Three 25-watt tungsten lamps light the living room, one 25-watt tungsten lamp is used in the kitchen, and three 15-watt lamps are installed, one each in the bedroom, screened front porch, and the garage, which is attached to the cabin.

How to Judge a Secondhand Automobile

By P. D. NOREM

Over one-half of the automobiles manufactured in the United States during the past few years have been purchased by individuals who were buying their first car, and who had practically no experience in operating an automobile. It is difficult for the inexperienced person to select an automobile that will give thorough satisfaction, as the number of cars and styles he has to choose from is large. He may examine a number of cars, and often becomes confused with the numerous details; finally he buys one. After the experience of the first season, he feels he can make a better selection and either sells his car or trades it in on a new one. This results in a large number of secondhand cars being sold each year, and the purchasers of such cars should make a thorough investigation of them. Unless such a car has been completely overhauled by a reliable concern, this precaution is necessary, before buying it at any price, no matter how cheap it may appear to be. Otherwise it may prove to be an expensive purchase in the end.

A few of the more important points to be considered in the selection of a secondhand car are the following: Find out the age, make, and type of car, in order to investigate the factory, or company, making the car, to see if it is still in business, financially responsible, can give good service in reference to repair parts for this particular model, or if they can be obtained elsewhere at a reasonable cost. Also determine if possible whether or not this particular model, and other cars manufactured by the same company, have in general proved satisfactory.

The material used in the construction of an automobile is of paramount importance. One should give this feature more consideration than the general appearance of the car, for, if the proper material has not been used, the car will not stand up, or give satisfaction. Do not, however, buy an ugly or very antiquated-looking car even if it has good material. When it is desired to sell the car, the appearance adds much to the value of the car with many persons.

Inspect the engine for compression, by turning it over with the starting crank; start it up and see how it responds to the throttle and if it will run very slowly without missing, knocking, or rattling. Investigate the oiling system, and make certain as to its proper operation. Inspect the radiator and its connections, to see that there are no leaks, and that the cooling water is circulating. Jack up the rear wheels and run them by means of the engine, to see if they run true. Observe whether or not the differential operates quietly. Try the various speeds and

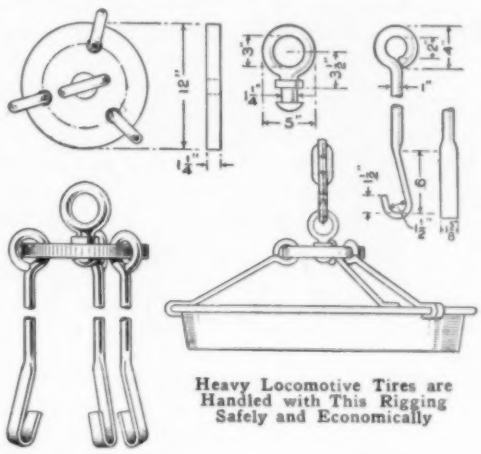
inspect the transmission, to see what condition the gear wheels are in, as any wear on these gears will show how much service the car has had. See if the front wheels are in line, if they run true, if the steering gear works properly. Inspect the tires on the car as well as extra ones, and make sure the size and kind can be obtained easily, as some sizes and kinds are obsolete. Inspect the wiring of the ignition, starting, and lighting systems, and ascertain whether or not they are in good condition, and function properly. Determine the condition of the storage battery, if there is one on the car. Inspect the oil, electric, or other lamps.

Make a thorough inspection of the frame, springs, doors, upholstering, top, curtains, and extra equipment. For a final test, run the car with a load, for 15 or 20 miles, trying out the various speeds and observing how the clutch takes hold. Pay particular attention to the engine under load, and, if possible, try pulling a full load up a five to ten-per-cent hill, as a car is practically useless if it will not pull up such an incline. Listen for pounding in the engine, and see if the water in the radiator "steams" quickly, which is a bad sign. Examine the bearings after the run, to see if any are unduly hot. Be sure to watch for cracked water jackets around the cylinders. The exterior finish should be one of the last considerations, although a neat appearance may be an attractive feature. Particular care must be given to the discovery of defects which may be hidden by the surface paint or finish.

Lifting Rig for Heavy Wheels or Pulleys

Difficulty was experienced in handling a large number of heavy, flanged tires for locomotive wheels, and the rigging shown in the sketch was devised as a result. It proved effective and has been adapted for use in handling other objects of irregular shape, by making special grips to fit the upper ring. The rig is attached to the hook of a crane, or other device for transporting the heavy object, and may be used under a variety of conditions.

The grips are fixed to a disk of steel plate, 12 in. in diameter and 1¼ in. thick. They are made of 1-in. steel rods, forged at the lower ends to the shape shown in the detailed sketches. It will be noted that the construction results in carrying the weight in balance and that there is little likelihood of the tire slipping from the grips because the downward pressure tends to increase the hold.



Heavy Locomotive Tires are Handled with This Rigging Safely and Economically

Silencing Rattle in Wood Turning

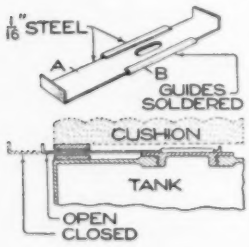
When turning the inside of thin-walled wooden objects, the operation is frequently accompanied by a disagreeable, shrill noise, and the turned surface becomes irregular instead of smooth. These conditions are the result of vibration in the unsupported thin walls, and the resistance to the turning tool causes small waves to appear on the surface of the work. The winding of a number of turns of thick soft string around the thin portion of the piece being turned will overcome these difficulties. Care must be taken to wind the string in a direction opposite to the rotation of the work, and the ends must be tied in securely, so that they will not become loosened and cause injury either to the operator or the object.—Charles F. Merrill, Hopedale, Mass.

Bearing Wheel for Gate

Fitting a wheel to the lower edge of a gate so that the weight is carried on the ground instead of on the hinges, as shown in the sketch, will prevent the breaking of the hinges as well as jarring the supports out of plumb. The gate was fitted into place in the ordinary manner, and the ground in front of it was smoothed and leveled to give a good bearing surface for the wheel, which was taken from an old wheelbarrow. It was fixed to the lower corner of the gate with sheet-metal straps, bolted through the boards.—Arthur Anderson, Batavia, Ill.

Vent Cover for Automobile Gasoline Tank

A small hole is usually provided in the filling cap of a gasoline tank to overcome the partial vacuum caused by the engine taking up the fuel. This hole must be kept open while the engine is in operation, but when not running the gasoline evaporates, and the gas passes out through the hole. To eliminate this, one automobile owner added a device to the tank cap by means of which the hole could be covered when the car was idle.



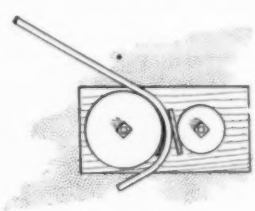
The device consists of a shutter, A, which operates between two slides, B, which are soldered to the top of the cap, as shown. The shutter is provided with a hole for the vent. To uncover the hole the shutter is pushed in, and to cover it, the reverse.

Maintenance of Dry-Battery Sets

In dry-battery sets, if two cases are wet and come into contact, if two binding-post nuts, zinc linings, or the metal of any connections, touch, the battery will soon go out of commission because of the exhaustion of one or more cells. Batteries should be separated by wads of paper or pieces of wood, and wet cases dried immediately. A dry-battery tester is inexpensive, and will indicate the condition of each battery. Carry reserves for batteries testing 10 amperes or less. New batteries should test at least 20 amperes. The voltage of dry batteries remains nearly constant at 1½, while the amperage decreases with use and age.

Bending and Polishing Brass Tubing

Brass tubes, 2 or 3 in. in diameter, and of considerable length, are bent into various forms for use as bar, bank, church-altar, and stairway railing by first subjecting the portion to be bent to the flame of a strong blowtorch, to anneal it. Without doing this, the tube will not bend satisfactorily, but will wrinkle and bulge at the point of bending in spite of a solid filling of rosin. After annealing, which has brought the tube to a dull red heat, it is allowed to cool slowly. It is then taken to the polishing department where it is greased off on a 100-grade emery wheel with plenty of grease, the tube being continually rolled on the revolving wheel. The cutting-down process follows on a sewed-cloth wheel, revolving at 2,800 revolutions a minute, using plenty of tripoli as the cutting agent.



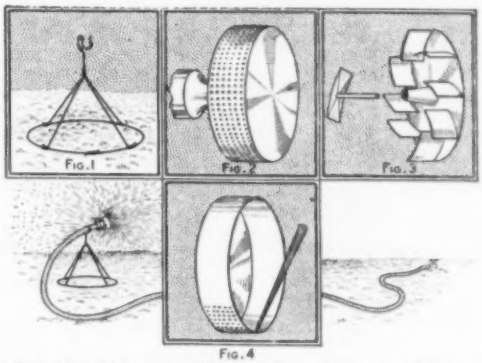
The tube is plugged at one end and filled with melted rosin. Rosin as a bending foundation in tubes is superior to sand in that it solidifies firmly, which sand cannot do. It is often left in the tube, thus increasing its

strength, which is impractical with sand. If it is desired to remove the rosin, the tube is drawn back and forth over a gentle gas flame, when the rosin will be forced out in the form of a long coré. In bending, care is taken not to mar or scratch the tube, as in the bent state it is difficult for the polisher to handle, when refinishing it. An iron rod, bent by measurement to correspond exactly with the form desired, is used to gauge the bending. On a bench, fastened solidly to the floor and with plenty of space around it, as shown in the sketch, two circular iron castings are bolted, 6 to 8 in. apart, the larger about 2½ ft. in diameter, the smaller about 1 ft. in diameter, and each about 4 in. thick. A wooden block—or two, if necessary, when bending tubes of small diameter—is laid against the smaller iron disk; a piece of leather is held against the side of the other disk, to prevent marring of the tube. The tube is then inserted between the disks and the bending usually done by three workmen. One attends to the gauging and the other two apply the pressure by leverage on the longer end. It must be bent upon the large iron disk, and care must be taken to shift the tube in the forms to produce the desired angle gradually. Once bent, the tube is again cut down and buffed by the polisher to a bright finish. Flanged supports receive the rail; caps are screwed on the ends of the tube, and it is ready for installation. The rail is seldom lacquered, as this would soon wear off in spots. Generally it is kept polished by regular use of a polishing compound. Often it is allowed to tarnish with the atmosphere, when it takes on a beautiful brown color, which is lustrous and lasting, as it cannot be rubbed off by handling.—Ralph W. Tillotson, Erie, Pennsylvania.

¶In brazing metal objects in a forge it is necessary to keep them on top of the fire so that the result may be readily seen. When the brass used begins to melt it may be known by the appearance of a blue flame.

Sprinkler for Narrow Strips of Lawn

The sprinkler shown in the illustration was made particularly to care for a narrow strip of lawn along a park-



This Sprinkler was Designed to Care for a Narrow Strip of Parking and was Made of Materials Gathered in the Home

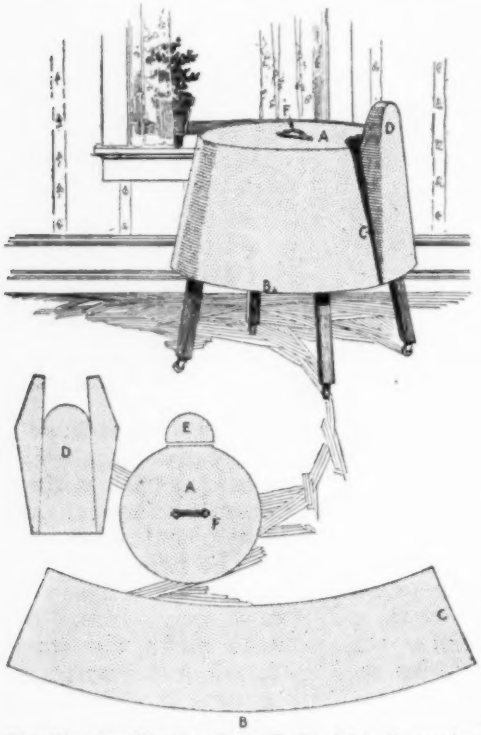
way. It will sprinkle a 3 by 40-ft. area, under 100 lb. pressure, and may be carried easily while in operation without danger to the person moving it. The materials used in its construction were "picked up" about the home and were the following: an oilcan, a hose connection, and 8 ft. of heavy wire. The latter was used to make the stand, shown in Fig. 1, which supports the sprinkler. The upper side of the device is shown in Fig. 2, and the method of punching the holes into the edge of the oilcan is shown in Fig. 4. In order to break up the spray, a wheel to revolve with the water was fitted into the can, and is shown in Fig. 3. A stationary axle was soldered into the can, and the wheel with its conical bearing and curved blades was placed within. Washers prevent it from touching the bottom of the can.—Edward R. Smith, Walla Walla, Wash.

Cover for Washing Machine

Keeping a washing machine clean, thus prolonging its period of usefulness, and having it ready for immediate use, is an economy that may be easily realized by the householder in providing a cover, as shown in the illustration. The use of casters on the legs of the machine is also a good kink, since

transporting it thus becomes more convenient. The diagrams below show the patterns for the cover, and may be adapted to various kinds of washers.

The cover may be made of canvas or



The Washing-Machine Cover Is Useful in Protecting It from Dirt, and may be Made Easily

strong cloth, but even an old piece of carpet may be used. To obtain the proper shape of material for the cover it is best to fit a paper pattern around the machine and use this as a guide in cutting the cloth. Use three pieces of paper, pinned together, if one large sheet is not available. The excess material is drawn up toward the top of the machine and pinned into folds. When opened, the paper sheet will appear somewhat like the large pattern C. The top of the pattern and the lower edge B should be trimmed off even with the top and bottom of the machine.

A circular piece of cloth, A, is used for the top. The handle F may be sewed directly to the top, or riveted through it into a wooden strip reinforcing the top. The patterns for the portion that covers the machinery must be made carefully. The section E is the pattern for the inner side of the wheel. The pattern for the edges and outer side of the wheel and fittings is shown at D. They are also made by fitting paper to the parts and trimming it off properly. The cover D is sewed to the main part at the seams C. Adjustment must, of course, be made for the shape of the machinery of each particular washing machine. The method described may be applied to the making of covers for various articles in the home and elsewhere, and the use of paper patterns, made by fitting them around an object, also has a wide application.—L. R. Busch, Omaha, Nebr.

Polishing Marble or Granite

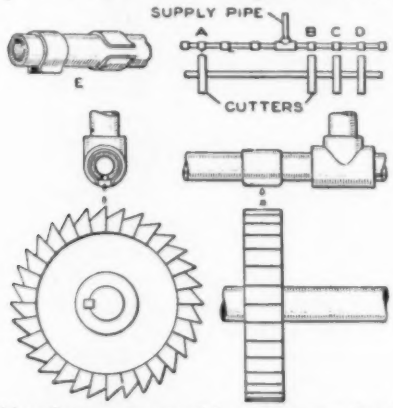
Electrical experimenters frequently have need for a slab of polished marble for mounting instruments, as switch bases and the like. The marble can usually be obtained, but it is not always polished, at least not on the edges and corners. A satisfactory method of polishing marble, or granite, is as follows: Rub the slab to be polished with a piece of sandstone, or emery, until it is perfectly flat. Then rub it with a piece of coarse-grit stone until all the emery scratches are gone. Next rub the surface with a piece of fine-grit stone until the coarse-grit scratches are removed, and then rub with a piece of pumice stone until no grit scratches remain. This done, rub with a piece of barber's hone until not a scratch is visible. Upon this depends to a great extent success in producing a polish.

When all the scratches are effaced, proceed as follows: Take a soft flannel cloth and fasten it around a small block; moisten the cloth slightly, place a few crystals of oxalic acid on the marble and crush them with the rag-wrapped block; then rub the marble until a polish appears. The longer the rubbing is continued the better the polish that results. Take care not to let the rag rest on one place too long, as the acid will eat into the stone. Use

the acid sparingly. The acid simply softens the stone while the rubbing brings out the polish. Oxalic acid is poisonous, and care should be taken in handling it, so as not to get any of it into cuts or wounds. Use plenty of water for the rubbing, but use only a moist cloth for the polishing. Rub until all the scratches are apparently gone, and then rub more to insure a good polish. The necessary stones for rubbing can be obtained from almost any marble or granite dealer for a small sum.—F. Sahlmann, Salina, Kan.

Oiling Gang Machine Cutters

Selective distribution of oil to milling cutters arranged in gangs is provided for by the method shown in the sketch. This device is simple and effective. It may be controlled easily, and supplies oil to the cutters as desired. The horizontal supply pipe, shown in the sketch at the right, feeds the oil from small holes, A, B, C, and D, bored at intervals in its under side. These holes are covered by spring-steel clips, as shown at E, when the flow of oil is to be shut off. The device is adaptable to a wide range of uses, and



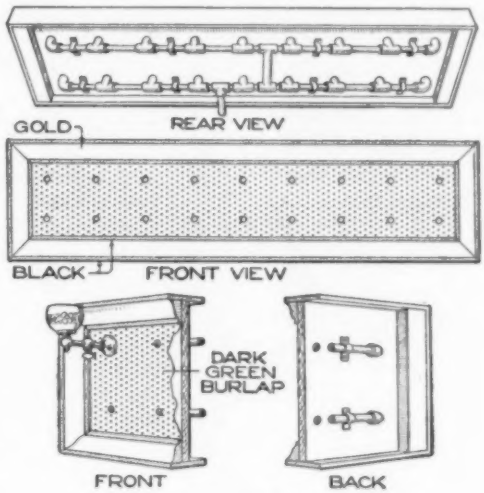
Machine Cutters Arranged in Gangs may be Oiled Economically by the Use of This Homemade Device

the supply pipe may be drilled with as many holes as required.—W. Burr Bennett, Bridgeport, Conn.

¶Joints subjected to heat should be packed with asbestos packing and never with rubber.

Display Board for Gas Brackets

A display board for gas brackets used by a gas company is shown in the



An Effective Display of Gas Brackets

illustration. The board was made with a frame extending around it, giving the appearance of a large picture frame. The parts of the frame were covered with gilt or painted black, as indicated.

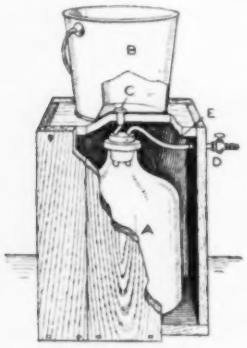
The gas brackets were screwed into the tees and elbows from the front of the board. The flat surface of the front of the board was covered with dark-green burlap. The device gives a very effective display of the company's wares.

Staining Streaked Wood Uniformly

When a piece of wood which is being stained runs from a dark shade to a very light one, it will be found that the darker portion is sapwood, and being softer, takes up more stain. If several pieces are joined together this may also occur. By cutting an ordinary flat brush diagonally across the hair, so that the bristles will be short on one side and full length on the other, and using it with the longest bristles on the hard wood, the surface may be stained uniformly. The bristles should, of course, be cut to a chisel edge after trimming them off on the diagonal.

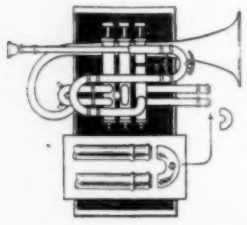
Automatic Air Supply for Blowpipe

When no air supply under pressure is provided for a blowpipe in the shop or laboratory, the arrangement shown in the sketch may be made quickly, and will give a constant supply of air for from 20 to 30 minutes. A wooden frame, or box, is constructed to contain a large glass bottle or a 10-gal. carboy, A. It is provided with a two-hole stopper and rubber tubes, connected through them, to the interior of the bottle. One of the tubes, E, is connected to a stopcock, D; the other is fitted through the bottom of an ordinary water pail, B, as shown at C. A metal, cork, or rubber fitting is provided at C, which may be plugged so that the pail is water-tight. The pail is then filled with water and connected to the bottle as shown. When the water is permitted to drain from the pail into the bottle, the air is forced out of the latter and may be conveyed to the blowpipe from the stopcock D.—Reginald R. Wayt, Pittsburgh, Pa.



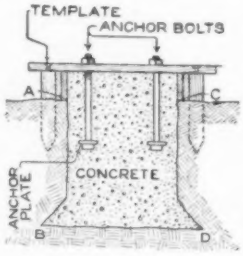
Repairing Slide on Brass Horn

In attempting to remove the broken slides from a horn, it was discovered that they had corroded and become fixed into place. When an attempt was made to withdraw them by force, the end of one of the slides broke off, as shown in the detailed sketch. The two portions of the slide which remained in the tubes were exposed very slightly, and apparently could not be removed without damaging the instrument. The following method was devised by which they were removed successfully: An iron plug was fitted snugly into the portion of the slide remaining in the tube. A hand vise was clamped over the small end of the slide exposed and gripped firmly against the plug. With this solid hold the broken-off portions were withdrawn without injuring them or the adjacent parts. The broken joints were soldered and the slide was fitted into its place after a thorough cleaning.—W. C. Loy, Rochester, Ind.



Concrete Foundation Fitted to Machine Base

If the soil in which the foundation for a machine is to be placed is firm enough to be self-sustaining, no forms are necessary to hold the moist aggregate. An excavation may be dug, as shown in the sketch, and to provide a larger bearing area at the base, the sides of the hole may be undercut, as indicated at B and D. If the foundation is to extend above the surface a frame of proper height may be built around it, as shown at A and C. The anchor bolts, which are to hold the machine in place, must be fitted carefully. A template, built up of strips and held in place temporarily by stakes, provides a good means of setting the bolts properly. Bore holes through the strips the proper distances apart and insert the bolts, with anchor plates at their heads as shown. Fix the templates into place accurately and pour the concrete around them. When the foundation is dry, which requires several days, the templates and forms may be removed.



¶Use sandpaper sparingly in brightening an armature or commutator, and never use emery cloth, as emery is an electrical conductor.

Average Table for School Grades

By W. A. GOODMAN

Recording and averaging school grades, particularly when extensive daily records are kept, consumes much of a teacher's time, and that usually at a period of the school year when other work is most pressing. The average table shown in the illustration was devised to economize time in keeping and averaging grades. It may be used by teachers as a private record system of grades, or pupils may be made familiar with the system so that they can quickly determine their averages and final grades. The table applies to monthly as well as term averages.

The daily records are to be entered in the daily grade book according to the following code, the grades being represented by numbers corresponding to the percentage grades indicated: 0 for 100, 1 for 90, 2 for 80, 3 for 70, 4 for 60, 5 for 50, 6 for 40, 7 for 30, 8 for 20, 9 for 10, and 10 for 0 per cent.

To find the average, first find the sum of all the grades entered for a particular pupil for the month or term; then find the number of grades entered. Turn to the table and locate, in the exterior column at the left edge, the number that corresponds to the sum of the grades, and, in the horizontal row of exterior figures at the upper edge, locate the figure that corresponds to the number of grades. Trace the finger tip, or other suitable indicator, horizontally along the column from the number located at the left edge, to its intersection with the vertical column under the figure located at the upper edge. The intersecting space contains the average sought.

Suppose, for example, that a pupil is given the following grades: 60, 90, 80, 100, 100, 50, 90, 80, 60, 100, 100, 100, 90. In the record book these would appear as 4, 1, 2, 0, 0, 5, 1, 2, 4, 0, 0, 0, 1. Following the method outlined, it is found that the sum of these grades is 20, and that the number of grades is 13. Turning to the table, locate 20 in the exterior column at the left, and then locate 13 in the horizontal exterior column at the upper edge of the table. Trace the horizontal column opposite 20, at the left, to the space in which it intersects with the vertical column under the figure 13, above, and it will be found that the number in this space is

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
0	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
1	90	95	97	98	98	98	99	99	99	99	99	99	99	99	99	99	99	99	99	100
2	80	90	93	95	96	97	97	98	98	98	98	98	98	99	99	99	99	99	99	99
3	70	85	90	93	94	95	96	96	97	97	97	98	98	98	98	98	98	98	98	99
4	60	80	87	90	92	93	94	95	96	96	96	97	97	97	97	98	98	98	98	98
5	50	75	83	88	90	92	93	94	94	95	95	96	96	96	97	97	97	97	97	98
6	40	70	80	85	88	90	91	92	93	94	94	95	95	96	96	96	96	96	97	97
7	30	65	77	83	86	88	90	91	92	93	93	94	94	95	95	95	95	96	96	97
8	20	60	73	80	84	87	89	90	91	92	93	93	94	94	95	95	95	95	96	96
9	10	55	70	78	82	85	87	89	90	91	92	93	93	94	94	94	95	95	95	96
10	0	50	67	75	80	83	86	88	89	90	91	92	93	93	94	94	94	95	95	95
11		45	63	73	78	82	84	86	88	89	90	91	92	93	93	93	94	94	94	95
12		40	60	70	76	80	83	85	87	88	89	90	91	92	92	93	93	93	94	94
13		35	57	68	74	78	81	84	86	87	88	89	90	91	91	92	92	93	93	94
14		30	53	65	72	77	80	83	85	86	87	88	89	90	91	91	92	92	93	93
15		25	50	63	70	75	79	81	83	85	86	87	88	89	90	91	91	92	92	93
16		20	47	60	69	73	77	80	82	84	85	87	88	89	89	90	91	91	92	92
17		15	43	58	66	72	76	78	81	83	85	86	87	88	89	89	90	91	91	92
18		10	40	55	64	70	74	77	80	82	84	85	86	87	88	88	89	90	91	91
19		5	37	53	62	68	73	76	79	81	83	84	85	86	87	88	88	89	90	91
20		0	33	50	60	67	71	75	78	80	82	83	85	86	87	88	88	89	89	90
21			30	48	58	65	70	74	77	79	81	83	84	85	86	87	88	88	89	90
22			27	45	56	63	69	73	76	78	80	82	83	85	86	87	87	88	89	89
23			23	43	54	62	67	71	74	77	79	81	82	84	85	86	87	88	88	89
24			20	40	52	60	66	70	73	76	78	80	82	83	84	85	86	87	87	88
25			17	38	50	58	64	69	72	75	77	79	81	82	83	84	85	86	87	88
26			13	35	49	57	63	68	72	74	76	78	80	81	83	84	85	86	86	87
27			10	33	46	55	62	66	70	73	75	77	79	81	82	83	84	85	86	87
28			7	30	43	53	60	65	69	72	74	76	78	80	81	83	84	85	85	86
29			3	28	42	52	59	64	68	71	74	76	78	79	81	82	83	84	85	86
30			0	25	40	50	57	63	67	70	73	75	77	79	80	81	82	83	84	85
31				22	38	48	56	61	66	69	72	74	76	78	79	81	82	83	84	85
32				20	34	47	54	60	64	68	71	74	76	77	79	80	81	82	83	84
33				18	34	46	53	59	63	67	70	73	75	76	78	79	81	82	83	83
34				15	32	43	51	58	62	66	69	72	74	76	77	79	80	81	82	83
35				13	30	42	50	56	61	65	68	71	73	75	77	78	79	81	82	83
36				10	28	40	48	55	60	64	67	70	73	74	76	78	79	80	81	82
37				8	26	38	47	54	59	63	66	69	72	74	76	77	78	79	81	82
38				5	24	37	46	53	58	62	65	68	71	73	75	76	78	79	80	81
39				3	23	35	45	51	57	61	65	68	70	72	74	76	77	78	79	81
40				0	20	33	43	50	56	60	64	67	69	71	73	75	76	78	78	80
41					19	32	41	49	54	59	63	66	68	71	72	74	76	77	78	80
42					16	30	40	48	53	58	62	65	68	70	72	74	75	77	78	79
43					14	28	38	46	52	57	61	64	67	69	71	73	75	76	77	79
44					12	27	37	45	51	56	60	63	66	68	71	73	74	76	77	78
45					10	25	36	44	50	55	59	62	65	68	70	72	74	75	76	78
46				a	8	23	34	43	49	54	58	62	65	67	69	71	73	74	76	77
47					6	22	33	41	48	53	57	61	64	66	68	71	72	74	75	77
48					4	20	31	40	47	52	56	60	63	65	68	70	72	73	75	76
49					2	18	30	38	46	51	55	59	62	65	67	69	71	73	74	76
50					0	17	29	38	44	50	55	58	62	64	67	69	71	72	74	75

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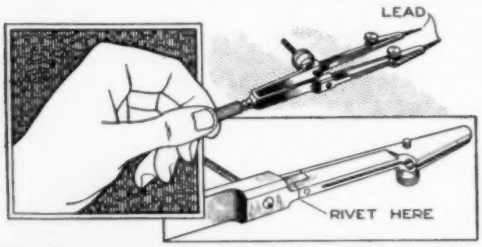
School-Grade Averages may be Determined Quickly by the Use of the Table, Economizing Time at Especially Busy Periods in the School Year

85. This is the pupil's average. In the table, fractions of less than one-half are dropped, and fractions of more than one-half are counted as one, in the percentage columns.

¶In turning down nails the best method is to strike a slight blow on the point of the nail so as to curve it and then drive the curved point into the wood, thus preventing injury by contact.

Compass Adapted for Making Lettering Guide Lines

Making lettering lines of uniform width for numerous small notes on

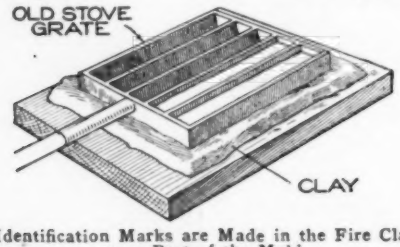


The Compass was Adapted for Making Lettering Guide Lines Quickly and Accurately by Replacing the Needle with a Pencil Leg

drawings consumes not a little time, and must be done carefully to give good results. In order to save time and insure uniformity I devised the double-lead compass shown in the sketch. It may be adjusted for any width of lettering lines up to an inch, and is used along a straightedge like a pencil or ruling pen. The needle leg of the compass was cut off and replaced by a pencil leg, as shown. The joint was shouldered and riveted, or may be welded. By marking an indication on the thumb wheel various standard heights for lettering may be obtained quickly and accurately.—M. A. Wise, Parsons, Kan.

Bar-Lead Molds

Lead, or solder, may be cast into bars of convenient size by pouring the molten metal into an old, straight-bar stove grate, as shown in the sketch. The grate is imbedded in a layer of



Identification Marks are Made in the Fire Clay as a Part of the Mold

fire clay into which identification marks are scratched so that they may be cast with the bars.

A Mosaic Finish with Paint and Varnish

A simple method of making an effective mosaic finish for furniture is as follows: Determine upon a design to be placed upon the surface, either to cover it completely or to decorate it at certain points. Apply a good quality of paint to form the design in various colors, as desired. The paint must be applied in several coats and allowed to dry between applications. Sandpapering between coats will aid in producing a smooth finish. After the paint has dried hard, sand the entire surface carefully with fine sandpaper and apply a coat of shellac followed by two coats of varnish, sanding carefully between coats. A rubbed finish may be produced by using powdered pumice stone and water, and polishing with oil.

Soot Scraper Aids Water Heating in Kitchen Stove

Soot and ashes which accumulate on the pipes of a water-heating front in a kitchen stove form almost as good a heat insulator as an asbestos covering. When the accumulations are removed better results may be obtained in heating water for the hot-water tank. A convenient tool for removing this soot may be made by filing a half-round portion out of the end of a strip of sheet metal and bending the end to a right angle. The curve at the end should be cut to fit the pipes, and the tool is used in scraping the pipes carefully until all accumulations are removed.

Blueprints That will Not Fade

To keep blueprints from fading when exposed to strong light, wash them in clear water until all the emulsion is removed; then place the wet print, right side up, on a smooth surface. With a paintbrush cover it with peroxide of hydrogen. This intensifies the blue background and brings out the white lines distinctly, making a print that will not fade under hard usage.

Spindle-Turning Device Effects Large Saving

A Lathe Fixture with Which a Sash-and-Door Mill Met an Emergency

By EARL E. HOPKINS

MEANS for utilizing waste from woodworking plants are becoming of much importance, particularly in view of the general shortage of lumber. As an example of how great economy may be made on an apparently insignificant item, by using waste wood in connection with a simple, specially constructed device, an actual experience is in point. The device described was designed and used to meet the special need, but has a wide application in the making of a variety of turned spindles. The illustration shows a specimen spindle, the device in operation, and detailed sketches of its construction. A saving of $21,000 was made by its use, in the filling of a rush contract for 1,000,000 screen doors.

Before closing the contract it was necessary to go into the lumber market to secure prices and deliveries upon the particular kinds of materials specified for the doors. It was necessary also to rearrange the mill so that the lumber would pass directly from the car, through the mill, and the finished doors would go directly into an outbound car. This was necessary, because the mill was not a large one, and the expense of piling the lumber and storing the doors had to be avoided in order to keep within the contract price.

This problem absorbed so much time and energy that it was decided to close the contract and figure out some of the smaller details a little later. This article deals chiefly with one of these details, the making of small ornamental spindles for about 100,000 of the doors. They were to be of a variety of shapes and sizes, and could be bought cheaply in the market, at 1½ to 2½ cents each in large quantities. An average of sixteen spindles to the door, for 100,000 doors, required 1,600,000 of them, which, at 1½ cents each, the price of the smallest, would be $24,000. Thus a small detail became important; and one of the mechanics in the mill was employed to devise a means to get out the spindles at less than 1½ cents each. He designed an attachment to a shop wood-turning lathe, which is shown in the illustration. The original was made of hard wood, and the knives, shaped to produce the spindles correctly, were mounted upon it. Old machine knives were used for the purpose; a roughing and a finishing knife for one size and shape were made.

A test showed that an operator could make from six to eight spindles a minute, of the 4 by ¾-in. size. It was evident that money and time could be saved on the job, for, at this rate, 2,000 to 3,000 spindles a day, depending upon the size and shape, could easily be turned out.

The material for the spindles was taken from the waste that would have gone to the kindling pile. It was ripped to the proper square size, and cut off to the various lengths to make the assortment required. Thus the material cost practically nothing, beyond the labor to sort it out and cut it up, which was done rapidly, and by the cheaper labor in the shop. The total cost was less than two mills each, and it was figured that power and maintenance would bring the entire cost of the spindles up to 1.9 mills ($0.0019) each—or about $3,000, as an outside figure. The difference between the cost of buying the spindles at about $24,000, and $3,000, actual cost, was a saving of $21,000. This figure is conservative, because the 1½-cent price was for the smallest and cheapest size.

This device, with all the knives, cost about $75 and it required no floor space. The saws for getting out the material were in the regular equipment of the mill, hence no other expense was incurred on account of the spindle job.

Not all sash-and-door mills are working upon screen-door contracts, but it is certain that thought and ingenuity could save considerable money by turning the small, sound scrap into handles, spindles, or grill ornaments,

for which there is a demand. In few instances, perhaps, would a saving of $21,000 in a year result, but a saving sufficient to give a handsome return upon a $75 investment could be made easily.

The illustration shows the device fitted in the lathe and in operation. The general arrangement of the various parts is shown clearly in the large sketch, there being no stock between the centers. The base, upon which the sliding carriage rests, is clamped to the lathe bed on blocks, and its right section is milled to form a tongue-and-groove slide with the carriage. The knives, which may be of a large variety, are clamped to their bases at the back of the carriage, which is provided with a handle at its front end, by which the operator moves the carriage and knives forward against the squared blank, between the centers. Two sets of knives are provided for each job, one for roughing out and the other for finishing. When long, slender baluster spindles are to be made, a steady rest is provided, to support the stock against the knives. The steady rest is shown raised in Figs. 1 and 2, and lowered into position, no stock being in place, however, in the larger sketch. In Fig. 6, it is shown in contact with the piece being turned. The carriage is shown, in Fig. 1, brought forward to the point at which the cut-off knives have severed the stock, and the device is in readiness for the next piece, which is inserted in the centering forks, I, Figs. 4 and 5, at the extreme forward end of the carriage. The squared blank is shown in place in the centering forks, Fig. 2, the centers of the lathe having been forced into the ends of the piece, to hold it during the turning operation. The knives shown in the detailed sketch, Fig. 6, are designed to shape a spindle of the type shown in Fig. 3.

The mechanism and operation of the device may be understood by reference to the detailed sketches, Figs. 4, 5, and 6, and in general to the other illustrations. The square blank is placed in the centering forks I, and the carriage B is pushed back to the stop J, properly adjusted at the screw K. To fix the blank in position it is then only necessary to bring up the tail, or cup, center E until the blank is held by the points of the live center D, and the cup center E. Then the slide is withdrawn, to permit free revolution of the blank, and the cup center is forced into the blank, driving it firmly against the spurs of the live center, as is necessary for the turning operation.

If the work is long and requires a steady rest, Fig. 6, a knife, L, is provided for cutting a groove around the middle of the blank, forming a circular neck on which the jaw of the steady rest bears, as indicated in the sectional view of the blank, at V, Fig. 6. The steady rest is brought forward, after the carriage has progressed sufficiently to permit the knife L to cut the neck, and is held in position with the hand, as shown in the large sketch, only while the heavy roughing-out cut is made, with the second knife M. The third knife N performs the finishing cut, and if an extra-smooth finish is desired, the spindles may be sandpapered lightly after the third cutting operation. The cut-off knives O are then brought against the work and the spindle is completed, by cutting it to the proper length. When baluster spindles are made, on which only the central portion is turned, the cut-off knives are not used. The lathe is not stopped for spindles that are cut off, but for long work it is safer to stop the machine while taking out and putting in blanks.

In using the steady rest, it is important that the rest does not exert too great a pressure on the work, only enough to steady it being desirable. This is provided for by setting the stop-lug collar R so that the lever T is permitted to come down the proper distance only, preventing "springing" of the work. The stop lugs are arranged so that the lever T may be thrown up and back of the supporting shaft Q; thus it will be held out of the way by its own weight. For a more detailed study of the steady rest the

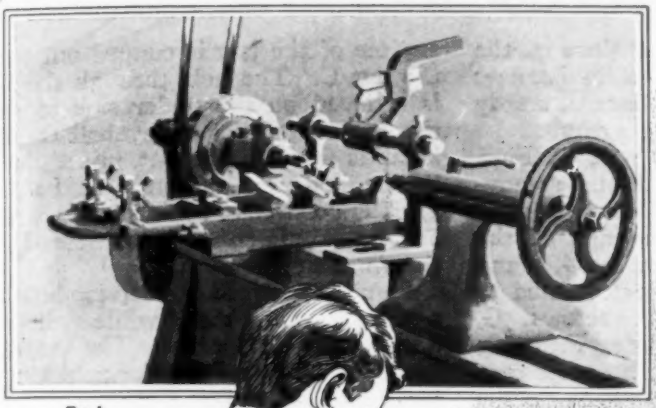


FIG. 1

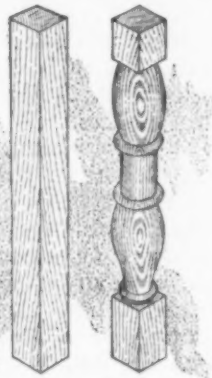


FIG. 3

FIG. 2

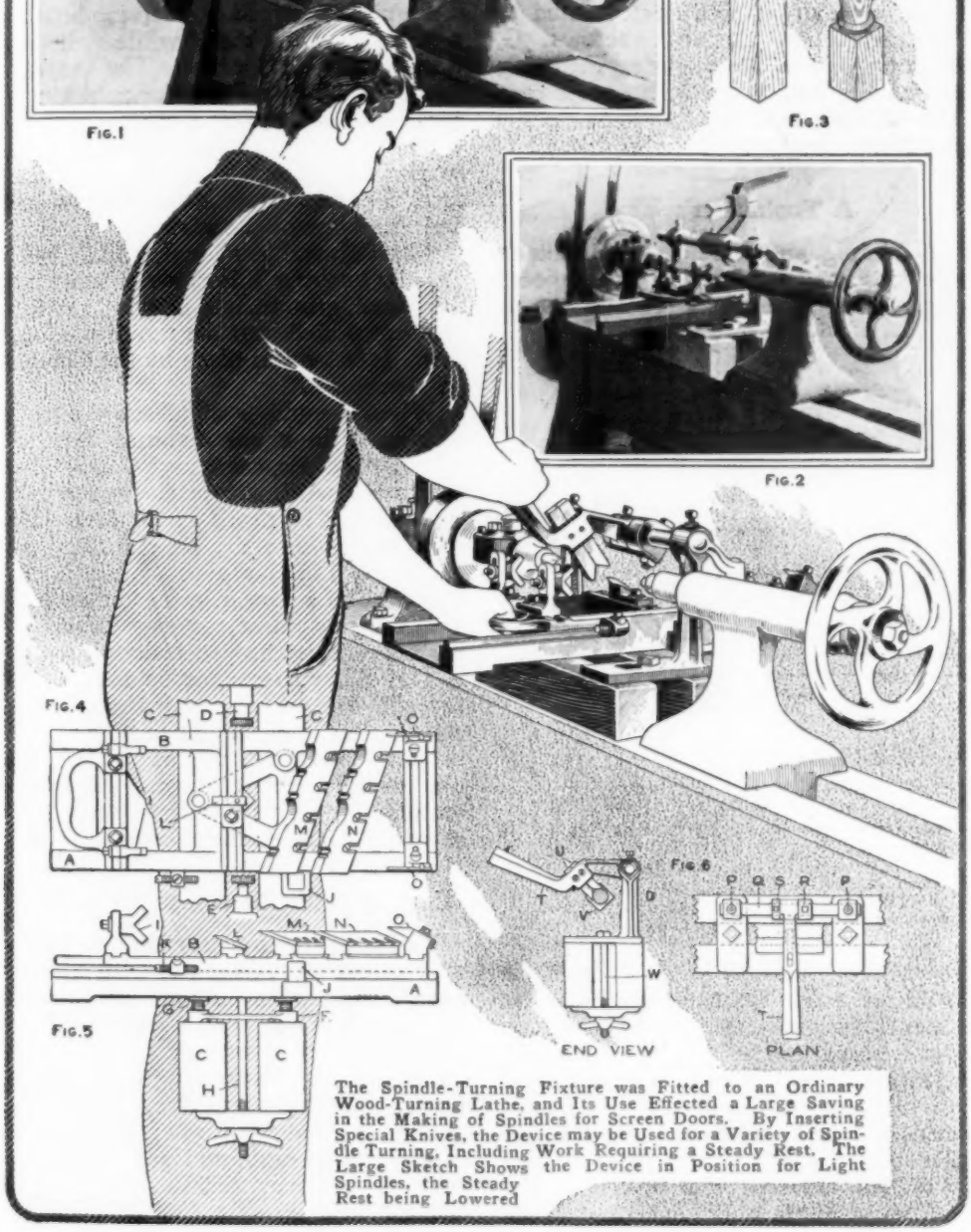


FIG. 4

FIG. 5

END VIEW

FIG. 6

PLAN

The Spindle-Turning Fixture was Fitted to an Ordinary Wood-Turning Lathe, and Its Use Effected a Large Saving in the Making of Spindles for Screen Doors. By Inserting Special Knives, the Device may be Used for a Variety of Spindle Turning, Including Work Requiring a Steady Rest. The Large Sketch Shows the Device in Position for Light Spindles, the Steady Rest being Lowered

following additional indications on the sketch, Fig. 6, will be of assistance: P, standards; S, plain collar; U, steady jaws; V, blank; W, binding bolts.

The large sketch, as well as Figs. 1 and 2, shows the bed and steady-rest frame supported on wooden blocks. The detail drawings of the working parts, shown in Figs. 4, 5, and 6, show an adjustable device fitted to the bed frame A, with screws, G, operating in a base plate, F. This makes the use of blocks unnecessary. The binding bolt H is used to fix the bed frame firmly to the lathe bed C.

A Toolmaker's Vise

A simple and efficient toolmaker's vise, designed for holding small pieces of irregular shape, is shown in the illustration. The body A, Fig. 1, is made of mild steel finished to the dimensions given, pack-hardened, the edges being ground square and polished on a lap wheel. The movable jaw B is made of mild steel and also pack-hardened, ground, and lapped square on the bottom and face. A hole is drilled through the center of the jaw, at an angle of 45°, and the upper surface of the jaw is cupped out to fit the nut C. The hole through the jaw is relieved on the under side to give ample clearance for the eyebolt D. The latter is fitted in the slot, milled, at E, in the body A, and may be held in various positions in this slot by a tempered steel pin through the holes F, as shown in Fig. 1.

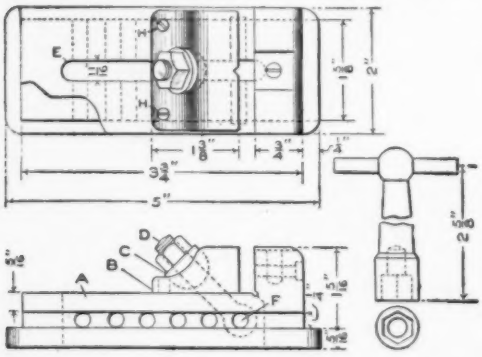


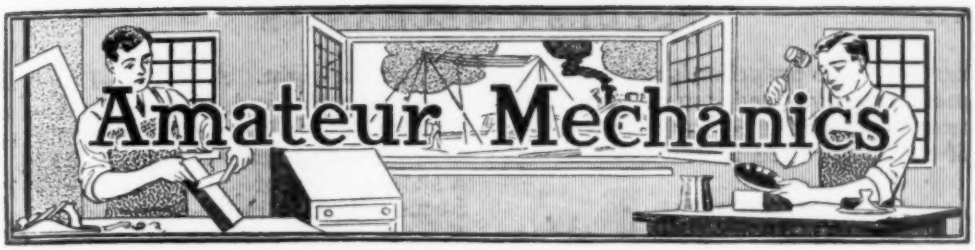
Figure 2 represents the vise holding a piece of round stock while a drilling operation is performed. The movable jaw B is set in an angular position by means of adjusting screws, H. By tightening the movable jaw on the work, the latter is forced down and held securely against the bottom and the fixed jaw of the vise.

The adjustable slide I, which holds the slip bushing J, is made of tool steel, hardened, ground, and lapped to fit into the seat milled into the top of the fixed jaw. It is held in place by the fillister-head screw K.

When a number of pieces are to be machined an equal distance from an end or shoulder, the gauge G is used to locate the work accurately in the vise. It is shown in detail at the left. The slots milled into the side of the body A, are used in clamping the vise to the faceplate of a bench lathe, the table of a milling machine, or any other flat surface where the projections on each end of the vise cannot be used. The holes F are drilled along these milled slots, which are shown in Fig. 1, one of them being exposed at the left corner of the upper view. A socket wrench for adjusting the vise is also shown.—E. P. Fickes, Dayton, Ohio.

Cutting Wide Slots with a Hacksaw

Mechanics frequently find it necessary to cut slots in metal with a hacksaw. When wide slots are required, so that a single cut from a blade will not make them, two or more blades may be placed together and a wider cut made. If the pins, over which the blades are hooked, are straightened slightly they will hold several blades with a uniform tension.—Louis M. Drake, Daytona, Fla.



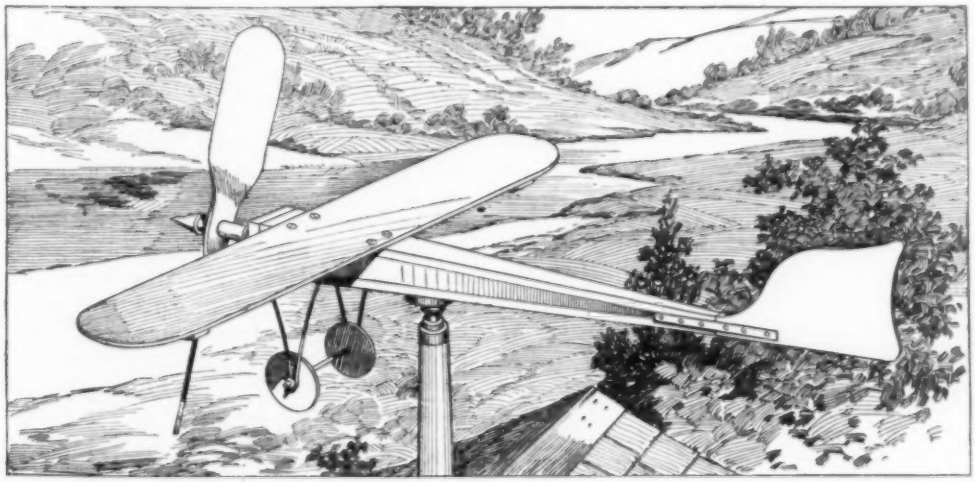
Monoplane Weather Vane and Windmill

By C. A. BENJAMIN

A SMALL monoplane adapted as a weather vane and windmill is shown in the sketch, and in detail in the working drawings. The design was not planned to duplicate the proportions and parts of a monoplane precisely in miniature, but rather as a device that can be made by the novice, of material easily available in the home or small workshop. The essentials of a weather vane are substantial construction, that will stand exposure, and a pivoting arrangement that will not interfere with the free operation of the vane in the shifting of the wind. The device described embodies these points and has the added feature of novelty. The general construction may be understood by referring to the sketch.

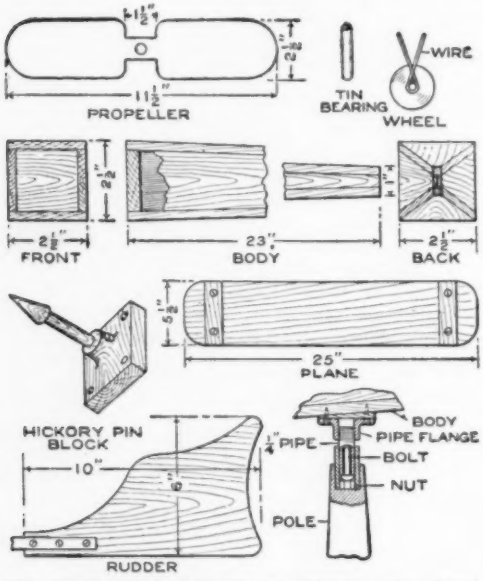
The body is built up of ¼-in. wood, in the form of a tapered box, closed at the ends, and 23 in. long. Its construction is shown in detail in the working drawings. The plane is fastened to the top of the forward end of the body with screws. It is ⅜ in. thick, 5½ in. wide, 25 in. long, and reinforced by small cleats near the ends, to prevent it from warping. The rudder is made of the same kind of stock used for the plane. It is 6 in. wide at the rear, and 10 in. long at the lower edge. It is fastened to the end of the body with small bolts, fitted through a strip of sheet metal on each side.

The propeller is carried on a wooden pin fixed into a square block, to which a shoulder piece is fastened. The latter may be provided by cutting away a portion from the surface of a thick block, and this is the method employed in making the shaft block shown in the working drawings. The block is fixed to the forward end of the body with



This Windmill and Weather Vane Is an Adaptation of the Monoplane to Simple, Substantial Construction, That Is within the Range of the Novice, Using Materials Easily Obtainable

screws. The propeller is made of sheet metal or galvanized iron of a fair thickness, like that used for roof flashing. If the metal used is not thick enough



The Constructional Details Are Simple. The Metal Propeller must be Balanced, and the Pivot should Operate Freely

to keep its shape under the pressure of the wind, it may be reinforced on the back of the propeller blades by soldering on a strip of metal in the shape of a ridge, and extending the length of the blade. The propeller may be provided with a bearing by soldering a coil or tube of tinned sheet metal into the center hole. The blades must be set so that their forward faces are inclined toward the direction of the wind, opposite edges of the blades being farthest forward, as shown in the sketch. The working drawing shows the propeller as cut from the piece of sheet metal, before the blades are twisted to produce the incline on them.

The wheels are made of disks of sheet metal, and supported on wires soldered to them. The ends of the wires are fastened to the sides of the body, as shown in the sketch.

The weather vane is supported on a pole, at the top of which is fixed a metal bearing as shown in the detailed drawing, at the right. A nipple of pipe is fitted into the end of the pole and a hexagonal nut fastened into its lower end. A round-headed bolt is fitted into a short section of ¼-in. pipe, so that it forms a bearing in the upper surface of the nut. A flange is fitted to the other end of the pipe. When the point of balance of the vane, complete with tail and propeller, is determined, the flange is fastened to the body at the point of balance, with screws. Care must be taken to fit a wedge-shaped piece of wood to the body so that when the flange is fixed into place, the weather vane will be horizontal.

The metal bearings should be oiled occasionally, as well as when the device is completed. Two coats of white lead, or other good exterior paint, should be applied to the device to protect it from the elements, and for ornamental purposes the parts may be given various bright colors, so as to be easily distinguished at a distance.

Avoiding Stained Fingers When Developing Photographs

Wooden spring clips are convenient in holding photographs in developing them, and will prevent the soiling of the finger tips. Immerse the print in the developer and move them back and forth with a jerky motion to prevent air bubbles. Do not hold the print in the same place all the time, as this may cause a white spot. When the print is developed, rinse it in clean water and release it above the "hypo" tray, taking care not to permit the clip to drop into it. Keep another clip to use with the "hypo" tray exclusively. The fingers must not be damp, as they may leave finger marks on both the paper and the negative. When many prints are made, the use of spring clips is especially desirable, since poisoning sometimes results from carelessness in handling photographic chemicals.—M. E. Fuller, Detroit, Mich.

¶Roller and ball bearings should be run a trifle loosely rather than too tightly.

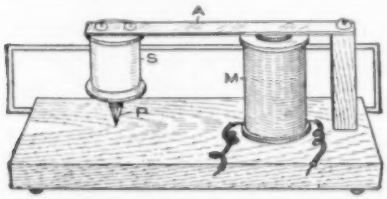
How to Use the Lawn Mower

Difficulty in the operation of a lawn mower is often caused by failure to use the machine properly. A lawn mower cuts like scissors except that one of the members is fixed. The cutters pass over the cutting bar at an angle and thus shear off the grass. The machine tends to throw the grass off to one side, usually toward the left; hence the machine should not be permitted to throw the cut grass back into the uncut patch. This may be prevented by passing around the lawn so that the uncut grass is at the right of the operator.—W. H. Kruse, Fort Wayne, Ind.

Telegraph Recorder with Spool-and-Pencil Indicator

A simple substitute for the somewhat complicated telegraph recorders of the inking type may be constructed of materials readily available to a boy. The instrument shown in the sketch was made in a short time and with no special outlay. The base and the upright support are of wood. The armature A was made of a strip cut from a tin box, and folded to a length of 4 in.

The recording device consists of a short piece of pencil, P, set in a spool, S. The electromagnet M is fixed to the base, and the armature A is actuated when current is permitted to pass through the magnet, causing the recording pencil to move vertically. A strip of paper is moved slowly under the pencil, and in order to make the



The Telegraph Recorder was Made of Materials That may be Gathered Easily by Boys

record regular a small channel-shaped guide of metal may be arranged under the pencil.—William Warnecke, Jr., New York City.

Campers' Bait Cache

Campers desiring a sure supply of angleworms for fishing will find the bait cache shown in the sketch con-

Angleworms for Fishing Bait may be Kept Satisfactorily in the Buried Box, Covered with Sod

venient and practical. A box, about 18 in. long and 10 in. square on the end, is sunk into the ground in a shady place, and all the bait dug by the campers on their arrival is placed into it. The soil used to fill the box should be rich, black loam, quite moist but not wet enough to be sticky. A few inches of the top of the box is left unfilled and a double layer of green sod is fitted over it, as shown in the sectional view at the right. The upper sod is arranged level with the surface of the ground and should be cut carefully so that it will not be observed by prowlers. If the region where fishing is to be done is such that angleworms cannot be obtained easily, it is best to dig them before starting for the camp. The bait cache may then be made as a convenient place in which to keep the bait in good condition for fishing.

¶After cleaning a shotgun, or a rifle, a cork large enough to be seen readily should be placed in the end of the barrel to prevent rusting. The cork should not be pressed into the end deeply as, if it is forgotten and the firearm discharged without removing it, a dangerous explosion may result.

A Hammock Sleeping Tent

Compactness in transportation and general serviceableness are features of the hammock tent shown in the illustration. It is made by sewing a piece of canvas to the sides of an ordinary "dog" or shelter tent and may be made of a piece of canvas or tarpaulin. The tent is suspended by the ridge from a heavy rope supported on trees or posts. It is kept taut on the sides by tent ropes attached to stakes driven in the ground. This form of tent is particularly convenient in providing a good sleeping place in very small space. It is free from dampness, and the camper is provided with a comfortable rest free from prowling animals, without the use of a cot.—Daniel C. Duvall, Washington, D. C.

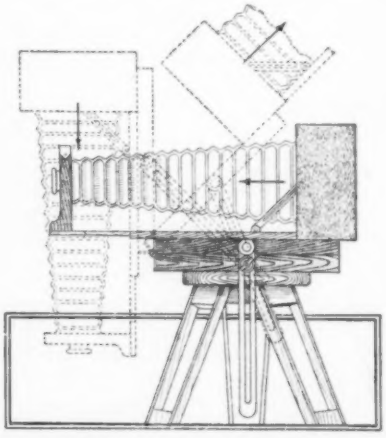
A Comfortable Sleeping Tent is Provided by the Arrangement Shown in the Sketch

Broken Spade Handle Repaired with Water Pipe

A garden spade, or fork, broken at the handle may be repaired by joining the broken ends with a piece of old iron water pipe. The broken ends should be trimmed carefully and driven into the piece of pipe. In order to make a more secure joint, holes may be bored and countersunk at each end of the pipe and screws fixed into them. If the break is so close to the handle that the latter is useless, a new one may be made by fixing a pipe tee, with a wooden rod as a handle, to the end of the fork or spade.—George H. Holden, Chesterfield, England.

Tilting Top for Camera Tripod

Pointing a camera up, or down, as in photographing tall buildings with the ordinary camera tripod, is awkward and requires much time to make a satisfactory adjustment. To overcome this, a tilting top was made for the tripod, as shown in the illustration. The extra top consists of two boards hinged at one end. The lower board has a tripod socket to fit the tripod, while the upper one has a tripod screw for fastening the camera. Two metal brackets are provided, having slots through which binding screws are fitted, and clamped with wing nuts. This permits the camera to be tilted at various angles, or reversed for vertical pictures, without removing it from the tripod. Several positions are suggested and a little experimentation will give numerous other possible uses. Devices of this character may be purchased, but the one shown is easily made and serves its purpose well.—R. C. Miller, Pittsburgh, Pa.



The Homemade Tilting Top Is Convenient in Making Photographs at a Variety of Angles

Homemade Electric Locomotive Model and Track System

By A. E. ANDREW

PART III—Construction of the Track System

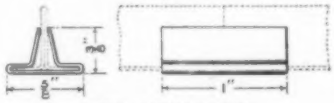
OPERATION of the electric-locomotive model described in the previous articles is feasible only with a properly constructed track system. This equipment, including curves and switches, is to be described in this, the final, article. Two functions are to be performed by the track system: It must serve as a support and guide for the locomotive and provide a path over which the current from the source of energy is supplied to the motor within the locomotive and returned to the source. On this basis, then, the construction may be divided into two parts: the mechanical and the electrical features. If the mechanical construction is not practical and accurate, the locomotive will not operate satisfactorily. The electrical connections must be given due care also.

The track should be of uniform gauge; the joints should be solid and free from irregularities, which cause "bumping" in passing over them. The material used should be stiff, so that it will retain its form, and preferably non-rusting. The rails must be insulated from each other, and proper means must be provided for making suitable electrical connections between the various sections. The construction of a straight and a curved section of track, together with a switch and signal, adaptable to various places on the system, will be considered in detail.

The straight sections may be made any suitable length; sections 16 in. long will be found convenient, as the metal pieces forming the rails may be bent into shape easily when they are short rather than long. The possibility of various combinations of straight and curved sections in a given area is increased by having the sections shorter. The rails may be made from tinned sheet-metal strips, by taking pieces, 16 in. long and 1½ in. wide, and bending them into the form shown in Fig. 1. The rails should be mounted on small wooden sleepers, ½ by ½ by 4 in., by means of small nails, or preferably small screws. The distance between the centers of the rails should be 2 in. The sections of track may be fastened together at the ends by means of a special connector, shown in Fig. 2, made from thin metal, preferably spring brass. The type of connector shown in Fig. 2 will not prevent the sections from pulling apart, and to prevent this, a second connector, similar to that

SECTION OF RAIL

Fig. 1



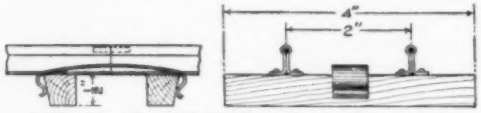
RAIL CONNECTION

Fig. 2

Shape the Rails from Sheet-Metal Strips, 1½ Inches Wide and 16 Inches Long, to the Form Shown in Fig. 1. The Rail Connections are Formed as Shown in Fig. 2

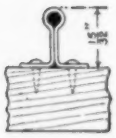
shown in Fig. 3, should be made. The sleepers at the ends of each section should have one side beveled, as shown, and these edges should be exactly one

inch from the end of the rails. A spring clip should be made, similar to that shown, which will slip down on



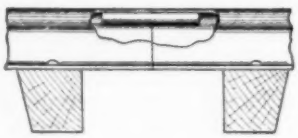
METHOD OF CONNECTING TRACK SECTIONS

Fig. 3



SECTION OF RAIL

Fig. 4



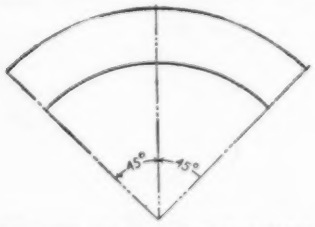
END CONNECTION OF RAILS

Fig. 5

A Spring Clamp for the Joints in the Sections is Shown in Fig. 3. An Improved Form of Rail is Shown in Fig. 4, and in Fig. 5 is Indicated the Method of Joining Its Sections

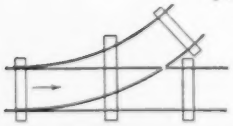
the inside of the end sleepers and hold the sections together.

A better form of rail is shown in Figs. 3 and 4, but it is somewhat more difficult to construct. In this case, instead of bending the piece of metal forming the rail over on itself and closing the space entirely, the metal is bent over a round form, such as a piece of wire, which may be removed, leaving an opening through the upper part of the rail from end to end. This gives a better form to the tread of the rail and



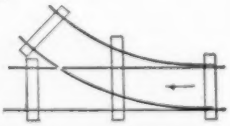
METHOD OF LAYING OUT CURVED SECTION

Fig. 6



LEFT SWITCH

Fig. 7



RIGHT SWITCH

Fig. 8

Lay Out the Switches and Curves, Full Size, and Fit the Rails to the Curves Accurately

at the same time provides an easy means of connecting the ends of the rails, as shown in Fig. 5. Small metal pins, about 1 in. long, and of such a diameter that they will just fit the circular opening in the top of the rail, are provided. One of these pins should be fastened in one rail at each end of a section, making sure that no rail has more than one pin in it, and that the arrangement of pins and rails corresponds in all sections. With proper care the various sections should fit together equally well, and they may be held together as shown in Fig. 3.

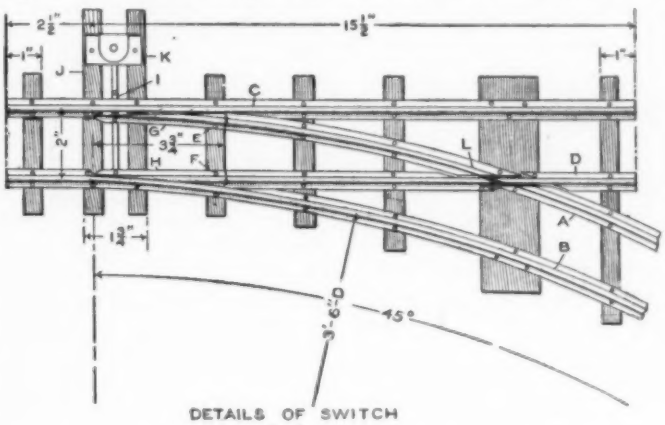
The curved sections may be made from rails similar to those described above, but some difficulty will be experienced in bending them into a curve because of the necessity of bending the lower flange on edge. The difficulty may be overcome by crimping in the inner edge of the lower flange and expanding the outer edge by hammering it on a smooth surface. The radius of the curve to which the inner rail should be bent in order to give a section of convenient length, and not too abrupt a curve, is 21 in. The circumference of such a circle is approximately 132 in., which, divided into eight sections, gives 16½ in. as the length of the inner rail of each section. Since the tread of the track is 2 in., the radius of the curve of the outer rail will be 23 in. The circumference of the circle formed by the outer rail is 145 in., which divided into eight sections gives 18⅛ in. as the length of the outer rail of each section. These curved rails may be mounted on sleepers, their ends being held in place, and the various sections fastened together, just as in the case of the straight sections.

Some trouble may be experienced in getting the curved rails properly shaped, and it would be a good plan to lay them out full size by drawing two circles on a smooth surface having diameters of 42 and 46 in., respectively, and divide each of the latter into eight equal parts. The form of the curve between these division lines and the lengths of the curves will correspond to the shape and lengths of the rails forming the curved sections of the track. The pieces should be cut slightly longer than required, and after

they are bent into shape their length can be determined precisely and extra portions cut off. Each curved section will correspond to ⅛ of the complete circle, or 45°, as shown in Fig 6.

The switches for the track may be of two kinds: left and right. They are named according to whether the car is carried to the left or right of the main track with reference to the direction in which the car moves in entering the switch. A left switch is shown in Fig. 7, and a right switch in Fig. 8, the direction of movement being indicated by the arrows.

A detailed drawing of a right switch is shown in Fig. 9. Rail A corresponds in form and length to the outer rail of one of the curved sections previously described; rail B corresponds to the inner rail of one of the curved sections, except that 2½ in. of straight rail is added at the left end. Rail C is a straight portion of rail, 18 in. in length, with a part of the base cut away at the switch, and rail D is a section of straight rail, 15½ in. in length, with the base cut away where it crosses rail A. The ends of rails D and A are hinged at the points E and F, 3¾ in. from the left end, with pins driven into the ties. The outside edges of the pieces G and H are filed off so they will fit up against the rails C and B respectively. Both the pieces G and H are attached to a strip of fiber insulating material, I, at their left-hand ends, in such a way that when the piece H is against the rail B, the piece G is away from the rail C about 3/16 in.; when the end of the piece G is drawn over against the rail C, the end of the piece H is drawn away from the rail B about 3/16 in. With these two combinations the car may be made to move along the main track or to the right on the curved track. The two long sleepers J and K are to provide a mounting for the switch-control lever and signal.



DETAILS OF SWITCH
Fig. 9

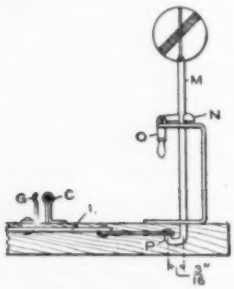
The Crossings of the Rails must be Fitted Carefully, and the Movable Sections G and H Arranged to Make the Proper Contacts

The rail A is not continuous where the rail D crosses it, but is broken as shown in the figure. A small notch should be cut in the surface of the rail D where it crosses the rail A, for the flange of the car wheels to roll through when the car is moving onto or off the switch. The sections of the rails A and D must be connected electrically. Rail A must be connected to rail C, and rail B to rail D.

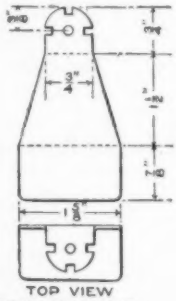
It is obvious from an inspection of Fig. 9, at L, that rail D will be connected to rail A when the car is on the switch, the car wheels passing over the point L, and a short circuit will result. This may be prevented by insulating the short section of the rail D at this point from the remainder of the rail, but the length of the insulated section must not be greater than the distance between the wheels on one side of the car; otherwise the circuit through the motor would be broken. If this is the case, and the car stops on the main track with both wheels on the insulated section, it would be impossible to start the locomotive until one wheel was moved to a live part of the rail.

The switch control is shown in Fig. 10, and the letters C, G, and I correspond to those given in Fig. 9. A ⅛-in. rod, about 4 in. in length, is bent

into the form shown at M. It is mounted in a frame, the details of which are shown in Fig. 11. A small arm, N, with a hinged handle, O, is



SWITCH CONTROL
Fig. 10



TOP VIEW
SWITCH FRAME
Fig. 11

The Signals Indicate the Open or Closed Condition of the Switch by the Small Disk, Which is Regulated by the Lever Switch Control

soldered to the rod, after it is placed in position in the switch frame. The arm N and the lever P should be parallel with each other. If properly constructed, the handle O will drop into the notches in the top of the switch frame, and prevent the rod M from turning. A connection should be made from the lever P to the end of the piece I, which will result in the switch being operated when the rod M is rotated one-fourth of a turn. After this connection is made, the frame of the switch should be fastened to the ends of the long sleepers, which were provided when the track part of the switch was constructed. Two small disks, mounted at right angles to each other, will serve as signals when properly painted, or as an indication of the open or closed position of the switch.

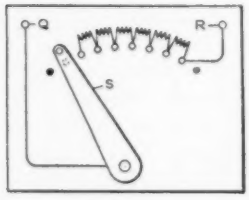


Fig. 12

The speed of the car on the track may be controlled by inserting resistance in series with the battery or source of electrical energy, or by altering the value of the voltage between the rails, by changing the connections of the cells forming the battery. The direction of movement of the locomotive cannot be changed unless the car is turned end for end, or the connections of the armature or field winding—not both—are reversed. The switch on the bottom of the locomotive reverses these connections.

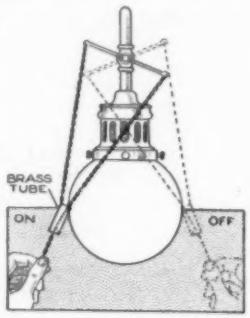
A small rheostat, which will give the desired resistance, may be constructed as follows: Obtain a piece of hard wood, 4 by 5 in., and ⅜ in. in thickness. Lay out a curve on this piece, as shown in Fig. 12 by the row of small circles. Procure eight round-headed brass machine screws, about ⅛ in. in diameter and ¾ in. in length, and 16 nuts to fit them. Drill eight ⅛-in. holes along the curve, spacing them ⅜ in. apart. File the heads of the screws off flat and mount the screws in these holes. Make a metal arm, S, and mount it on a small bolt passing through a hole drilled at the center from which the curve was drawn, along which the screws were mounted. This arm should be of such a length that its outer end will move over the heads of the screws. Mount two binding posts, Q and R, in the upper corners of the board and connect R to screw No. 8, and Q to the bolt holding the arm S in place. Connect small resistance coils between the screws, starting with screw No. 2; screw No. 1 corresponds to an open circuit and is shown in contact with the arm S. Two stops, indicated by the black spots, should be provided, to prevent the arm from moving back of screw No. 1 or beyond screw No. 8. The board may now be mounted on a suitable hollow base, and the rheostat is complete.

Two binding posts should be mounted on the ties of one section of the track, and one of them electrically connected to each of the two rails, which will give an easy means of making the necessary electrical connections to the source of energy. After careful examination, to make certain that the locomotive is in running order, a test run may be made. If the locomotive operates properly and difficulty is experienced when it is placed upon the track, check up thoroughly on all rail connections, insulations, and other elements in the electrical equipment.

Cars of a proper gauge may be coupled to the locomotive, and "runs" made as extensively as the track system will permit.

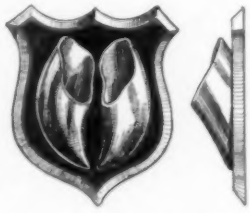
Sleeve Aids in Distinguishing Gas-Fixture Chains

Annoyance through inability to locate quickly the proper chain for lighting a gas lamp in the dark was overcome by fitting a small brass tube to one of the chains as shown in the illustration. The tube was soldered to the chain by which the light is turned on and the other chain passes through the tube and is grasped below it. To turn on the light, it is only necessary to slide the hand along both chains and to grip the tube, drawing on the chain attached to it. To turn the light off, the exposed end of the other chain is drawn.—Thomas W. Benson, Hastings upon Hudson, N. Y.



An Ornamental Horn Match Holder

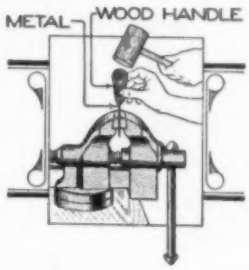
A match holder made of the horn shell of cattle hoofs mounted on a wooden shield, as shown in the sketch, is both ornamental and useful. One of the pockets holds the unused matches and the other the burnt ones. The hoofs were cleaned thoroughly and polished and the edge of the shield was beveled off and varnished in the natural color of the wood. The front was lacquered black and also varnished.



¶A small flat piece of wood is convenient for pointing up an eraser.

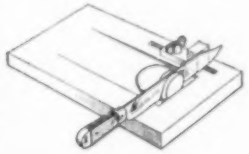
Driving Thin Metal into Wood

A slender piece of flat, or round, metal may be driven into a wood handle without breaking the wood or bending the metal, if it is placed in a vise and the wood part driven onto the small portion projecting from the jaws of the vise. Repeat the operation until the metal is driven far enough into the wood.



Slicing Board for Camp or Kitchen

The board illustrated was suggested by a device used by a "sandwich man," and proved practical for use in the home and especially in the camp. Potatoes, or other articles of food to be sliced, are placed in the hollow portion of the board and moved against the edge at the right, under the knife. The guide, which may be adjusted by means of the wing nut, permits slices of varying thickness to be cut.—Robert C. Knox, St. Petersburg, Fla.



Cleanly Pencil Sharpener

Pencils may be pointed without spreading the dust from them by the use of the device shown in the illustration. A piece of emery paper is fixed to one side of the cover of the box. By turning over the cover with a handle, after a pencil has been pointed, the dust may be dropped into the box and removed from time to time.—Sidney Block, Detroit, Mich.

A Simple Cipher Code

Adapted for Use in Private Correspondence

By CAPT. W. H. WALDRON, U. S. Army

HAVE you ever needed a secret code in which to couch the contents of a message intended for the eyes of one person alone? If you have, you will remember the difficulties that were experienced in making up the code and enciphering your letter. Here is a cipher code that may be mastered

G	R	A	N	T
F	IJ	E	L	D

Fig. 1

G	R	A	N	T
B	C	H	K	M
F	IJ	E	L	D
O	P	Q	S	U
V	W	X	Y	Z

Fig. 2

C	H	A	IJ	R
B	D	E	F	G
K	L	M	Q	S
O	P	T	U	N
V	W	X	Y	Z

Fig. 3

The Cipher Code Illustrated in These Diagrams may be Adapted for Wide Uses by the Substitution of Appropriate Key Words for Those Shown

in a few minutes; one that is most difficult to decipher by any person other than those having the key words, and that is very simple when once understood.

It is commonly known as the "Play Fair" code and is in use in some of the foreign military services. It is a substitutive cipher which operates with one or more key words, two letters in the code being substituted for each two letters in the text of the message. In preparing the cipher code by this method the key words are selected by the correspondents and their location in the cipher square mutually agreed upon. A large square divided into 25 smaller squares is drawn, as shown in Fig. 1, and the letters of the key words entered into their proper spaces, the remaining spaces being filled by other letters of the alphabet. The key words must not contain duplicate letters. The letters I and J are considered as one and entered in the same space, the letter I being invariably used in enciphering.

Suppose that the two words "grant" and "field" have been selected for the key, the same to be entered respectively in the spaces on the first and third horizontal lines of the square. Then the basis of the construction would be as indicated in Fig. 1. Now fill in the remaining fifteen spaces of the square with other letters of the alphabet, beginning at the blank space at the left of the second line, entering the letters in rotation and not using any letter of the key words. The completed cipher would then appear as shown in Fig. 2.

The text of the message to be sent is then divided into groups of two letters each and the equivalent substituted for each pair. Where two like letters fall in the same pair the letter X is inserted between them and when the message is deciphered this additional letter is disregarded. If one letter is left over after the last pair, simply add an X to it and make a pair.

Suppose it is desired to send this message in the cipher: "Will you meet me as agreed." Having three pairs of the same letter, it will be necessary to break them up by placing the letter X between them. The message will then be paired off as follows:

WI LX LY OU ME XE TM EA SA GR EX ED

The message may now be enciphered, after considering three simple rules for guidance: Every pair of letters in the square must be either in the same vertical line; in the same horizontal line; or at the diagonally opposite corners of a rectangle formed by the smaller squares within the large square.

In the first case, R and P are in the same vertical line (the second), and the next letter below, in each case, is substituted for R and P, which are C and W. If the pair consists of K and Y (fourth vertical), substitute L for K and go to the first horizontal line (fourth vertical) for Y, substituting N for Y. In the second case B and H are in the same horizontal line (the second), and thus substitute the next letters to the right, which are C and K. If the pair consists of P and U (fourth horizontal), substitute Q for P and then go back to the first vertical line (fourth horizontal) and substitute O for U. In the third case, R and S are at the opposite corners of a rectangle. Each letter of the pair is substituted by

the letter in the other corner of the rectangle on the same horizontal line with it. Then R would be represented by N, and S would be represented by P. To illustrate further, NE would be represented by AL; BZ would be represented by MV; TP by RU.

The message may now be enciphered, applying the rules:

WI LX LY OU ME XE TM EA SA GR EX ED
RP EY SN PO HD AQ MD QH QN RA QA LF

In sending this message, to make it more difficult for the inquisitive cipher expert, divide the substituted letters into words of five each and give him the added task of determining whether the cipher used is the transposition or the substitution method. The message ready to hand to the telegrapher would read:

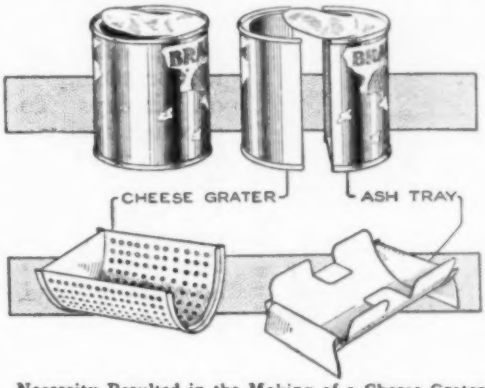
RPEYS NPOHD AQMDQ HQNRA QALFX

In deciphering a message the method is reversed. Take the message as received, divide the letters into pairs, and disregard the final X, which was put in to make a five-letter word. Then apply the key reversed. Practice it on the above message to get the system with respect to letters occurring at the end of the lines. Where the letters of a pair are in the same vertical line, substitute for each the letter above; where they are in the same horizontal line, substitute the letter to the left; where they are in the corners of a rectangle, substitute the letters at the opposite corners on the same horizontal line. To test the understanding of the system, the message given in Fig. 3, with the key words "chair" in the first horizontal line and "optun" in the fourth line, may be deciphered. The message to be deciphered is as follows:

FQVUO IRTEF HRWDG APARQ TMMZM RBFVU
PICXM TRMXM AGEPA DONFC BAXAX.

Cheese Grater and Ash Tray Made from a Tin Can

Being in need of a cheese grater and finding it inconvenient to go many miles to town, I constructed a satisfactory makeshift. I took a heavily tinned can and cut it in two, as shown in the sketch. By punching holes through it from the inside a practical grater resulted. From the remaining half of the can I made an ash tray, as shown at the right of the sketch.

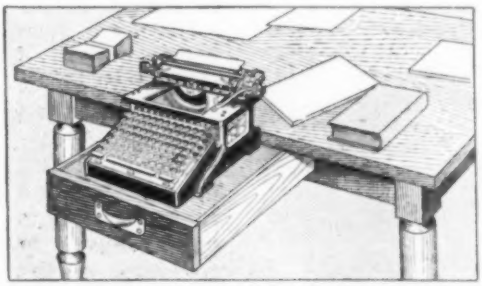


Necessity Resulted in the Making of a Cheese Grater and Ash Tray from a Tin Can

The semicircular ends were bent over to form a rest, and by cutting portions at the sides and bending them in, a convenient rest for a pipe or cigar was afforded.—Gus Hansen, Peachland, B. C., Canada.

An Improvised Typewriter Desk

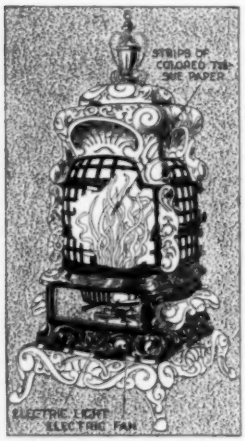
Travelers and others who carry typewriters on their journeys frequently find it inconvenient to use the tables provided because they are usually too high for typewriters. A method of overcoming this difficulty is to withdraw the drawer from the table and invert it in the slide as shown. The typewriter may then be placed upon the bottom of the drawer and will be considerably lower than if placed upon the table top.



Remove the Drawer and Replace It Inverted, to Provide a Convenient Rest for the Typewriter

An Inexpensive Imitation Fire

Window decorations may frequently be made attractive by the use of an imitation fire in a stove or a fireplace, when an indoor setting is on display. To produce such an effect, put an electric fan below the place at which the imitation fire is to be arranged and run an electric-light cord, with a red globe attached to it, to the center of the "flame." Cut a number of strips of Indian red tissue paper and fix the lower ends of these to form a circular mass above the globe. When the light is turned on permit the fan to direct a stream of air against the tissue-paper ribbons, forcing them upward to appear like tongues of flame. The sketch shows this method applied to a heater. The fan is placed in the ash box and the electric light is conducted through the grate.



Jardinière Made of Metal-Lamp Body

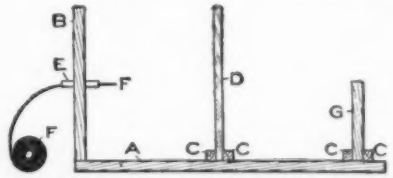
Some of the metal bodies of old lamps, and they are usually brass, are of such ample size and so neatly embossed that they can be readily used as jardinières instead of being handed to the junk man. It is only necessary to remove the lamp part, and set the plant pot into the bowl of the stand, as shown in the sketch.—H. N. Wolfe, Chicago, Ill.

Replacing a Broken Coffeepot Knob

A knob was broken from the lid of a coffeepot, which was valued by reason of its associations. Attempts to fasten the broken portions together were unsatisfactory, and the rough surface, where the earthenware was broken, was ground smooth and fitted with a carefully shaped wooden knob. A hole was drilled through the center of the lid with an old file and the wooden knob bolted into place. When stained appropriately, the repair was quite satisfactory.

Homemade Magnesium Printer

A convenient homemade printing device consists of a smooth board, A, 2 ft. long and 1 ft. wide, and an upright, B, which is 1 ft. square. Bore a hole in the center of the upright for the small tin holder E, to carry the magnesium ribbon, made by folding a piece of tin to fit it. Small pieces of wood, CC, are nailed across the board to hold the ground glass D and the printing frame G. The ground glass is 10 in. from the upright, and the printing frame is 10 in. from the ground glass. The latter is 1 ft. square and is used to diffuse the light from the magnesium ribbon F, which may be purchased from any dealer in photographic supplies. The length of exposure varies according to the length of ribbon which is permitted to burn. This should be tested out carefully before making exposures. — Gustave Straub, Albany, N. Y.



Length of Magnesium Ribbon Burned Determines the Time of Exposure

¶In sandpapering a varnished surface between coats, especial care should be taken to avoid rubbing through at sharp edges.

A Submarine Camera

by Charles I. Reid

SUBMARINE photography should have great attractions for amateur photographers who have access to lakes, ponds, and other clear waters. While more careful work is demanded than in ordinary photography, the method of obtaining good results is not difficult, and the necessary equipment may be provided by constructing the device shown in the illustration. Submarine pictures can be taken in a considerable depth of water, providing it is reasonably free from foreign matter. This is a fascinating field of photography, and many pictures of educational and scientific value remain to be made of under-water life. The illustration shows the detailed construction of the camera chamber, and the method of suspending it from a bridge, or other place convenient to the body of water. Reproduced in the oval panel is a photograph of fish near baited hooks, on a fishline. The original was made from a negative exposed by the use of the camera chamber described.

The problem of making photographic exposures under water involves the provision of a strong water and pressure-proof container for the camera, a means for controlling the shutter, and a suitable opening in the container through which the exposures may be made. The arrangement described combines these features in a simple manner, and by the use of materials that can be obtained without difficulty. It was made for a camera taking 4 by 5-in. pictures, and the dimensions given are for a container for this size. The dimensions may be varied to adapt the device to various cameras, within reasonable limits. A 9-in. steel pipe was used for the chamber, and its ends were fitted with pipe caps. A heavy piece of plate glass was fitted into the forward cap, which was cut into the shape of a ring, to provide the exposure opening. The general arrangement of the camera in the chamber is shown in the sectional view, Fig. 1, as seen from the shutter end. The electrical device, by which the shutter is controlled, is shown in this view, and in Fig. 2 it is shown in detail.

The chamber was made as follows: A section of 9-in. steel pipe was cut to a length of 11½ in. and threaded on the ends to fit pipe caps. The forward pipe cap was chucked up in a lathe and the center portion cut away, to provide an exposure opening and a shoulder at the rim, on which the plate-glass window rests. A graphite paint was applied to the rim, then the glass was bedded solidly in it, and a rubber gasket was fitted to the joint, making it waterproof when the cap was drawn up tightly. The chamber assembled and in detail is shown in the illustration.

Holes were bored into the top of the chamber, and eyebolts were fitted into them. Between the eyebolts a hole was bored and fitted with a water-tight collar, through which the wires leading to the shutter-control device pass. The chamber is supported by the wires, which are fixed to the eyebolts and secured at the base of operations by the photographer.

A support for the camera was provided by bending a strip of ⅛ by 1-in. band iron to the shape indicated in Fig. 1, at A, and riveting it to the bottom of the chamber. Its upper surface is flat and was bored and threaded to fit the tripod thumbscrew B, on the lower surface of the camera. The camera is arranged on the support and clamped into place firmly by the thumb nut, as it might be on a tripod. The adjustment of the camera in the chamber is done from the rear, and the space beneath the thumbscrew should be large enough to make access easy. A camera of the size indicated, when fitted with its lens centering on the center of the window, will be raised sufficiently for

convenience in clamping it. The threads on the back cap must fit snugly and no paint must be used on them. Hard oil, or vaseline, may be applied to insure a water-tight joint that permits easy removal of the cap.

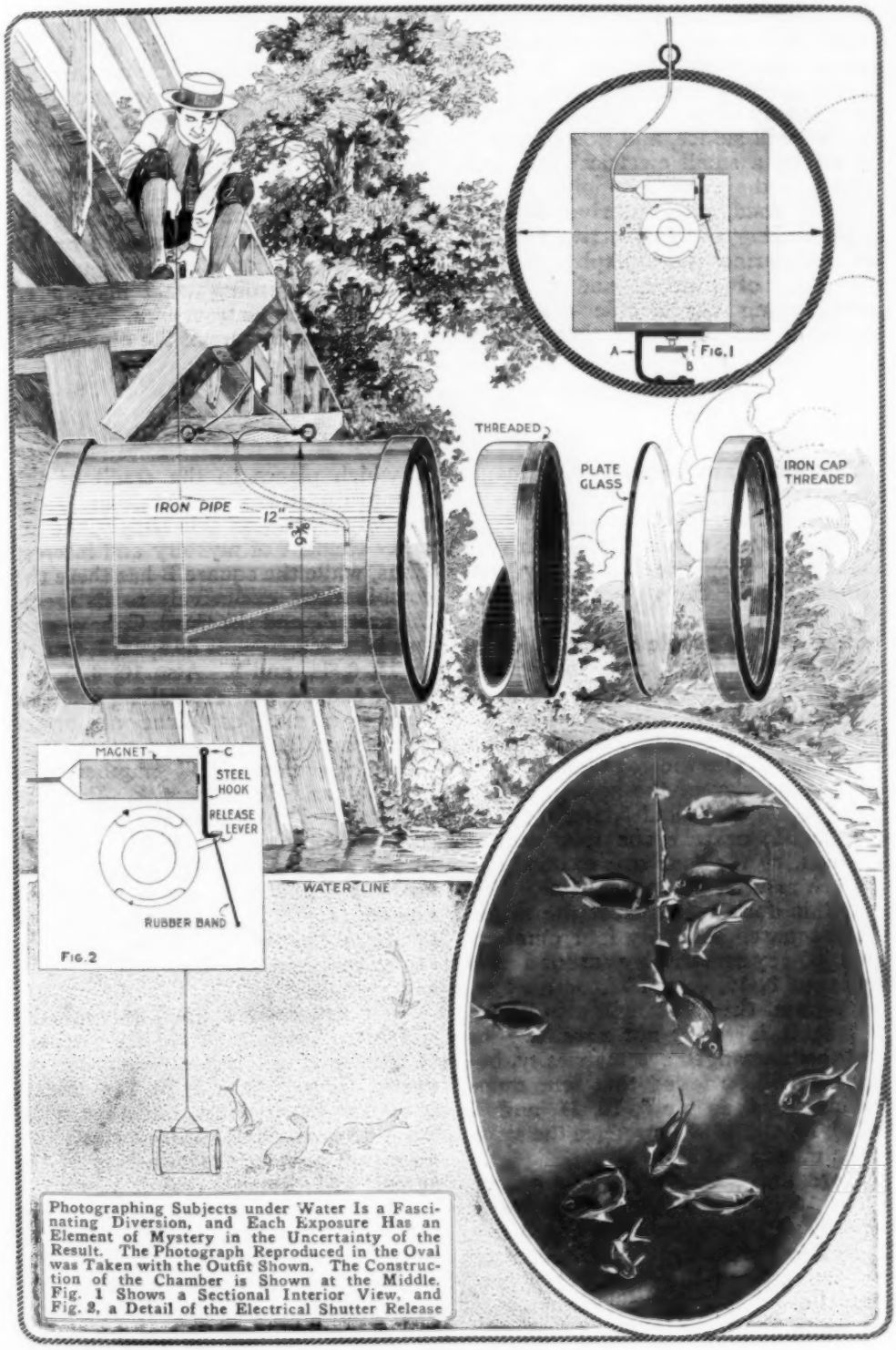
The making and adjustment of the electrical shutter device requires care, but its operation is simple. An electro-magnet, of the type used on doorbells, was fixed to the front of the camera, above the shutter, as shown in Fig. 1, and in detail in Fig. 2. It is actuated by current from two dry cells. The latter are kept in a convenient carrier at the base of operations, and are connected to the magnet by a single strand of double, waterproof wire. This is spread as it reaches the chamber and fastened to the two eyebolts in the top. The ends of the wires are conducted through the water-tight center opening between the eyebolts, and attached to the magnet. The release lever is fitted to a steel hook, pivoted at its upper end with a small nail, C, Fig. 2. A rubber band is fixed to the lower edge of the shutter lever and its other end is attached to the front of the camera. When the current is permitted to flow into the magnet by pressing a contact key, in the hand of the operator, the steel hook is drawn from the release lever, and the rubber band draws the lever down, making an exposure.

The double-wire cable carries the current as well as holds the chamber suspended in the water. The wire should be about 25 ft. long, and, in transporting the outfit, or when only partly used, is coiled. The chamber should be completed for picture-taking operations by giving it a coat of dull, black waterproof paint, both inside and outside. This will prevent rusting and also serves to make the object inconspicuous when in the water. It is important that the interior be painted in this manner, because reflections of light within the chamber may cause difficulty in obtaining satisfactory results. When the paint is thoroughly dry, the device may be tested for leakage and assembled ready for a test before making an actual trial in the water. The camera is fitted into the chamber so that it centers on the center of the plate-glass window, and is clamped into place. If the electrical device operates satisfactorily the plate may be inserted, the plate-holder slide withdrawn, the back cap replaced securely, and the outfit lowered into the water. It should be watched carefully until it reaches the proper depth, for, if it is permitted to touch the bottom, the sediment stirred up must be given time to settle before an exposure is made. The forward end of the chamber should be marked on its upper edge with a streak of white paint, to aid in identifying it at considerable depth in the water. This is important, since the operator must shift the chamber carefully until the window faces the objects to be photographed. When the chamber is in position, the contact key is pressed, and the exposure is made.

The time of exposure for under-water photography depends on the clearness of the water, the depth at which the pictures are to be taken, and the light conditions on the surface. A bright day is, of course, desirable for this class of photography. A safe approximation, on a sunny day, in clear water, and with the chamber lowered to a depth of 20 ft., is $\frac{1}{25}$ sec. at the F 8 stop. The fastest plates or films obtainable should be used for this work, making possible a fairly rapid shutter speed. This tends to overcome the movement of the subject and possible movement of the camera.

The camera should be focused while in the chamber in order that the plate glass may not disturb the focus. The glass usually changes the focal length of the lens slightly, hence this precaution must be taken. The camera should be focused in the chamber for a distance of 10 ft., as this is the average at which under-water photographs will be taken ordinarily.

When attempting under-water photography in cloudy waters, or at a considerable depth, the necessary illumination may be provided by a charge of flash-light powder. For this purpose another submarine chamber, similar to



Photographing Subjects under Water Is a Fascinating Diversion, and Each Exposure Has an Element of Mystery in the Uncertainty of the Result. The Photograph Reproduced in the Oval was Taken with the Outfit Shown. The Construction of the Chamber is Shown at the Middle. Fig. 1 Shows a Sectional Interior View, and Fig. 2, a Detail of the Electrical Shutter Release

that used for the camera, should be provided, with a plate glass, ½ in. thick, and a valve fitted into the top of the chamber, and opening outward, so that the gas may escape. Fifteen grains of powder will suffice, and this should be set off by a small electrical fuse connected to the current supply.

Every pond, lake, and river abounds in interesting and instructive subjects for submarine photography. Along the coast of Florida, and at many points along the Pacific coast, are waters of such clearness that pictures may be taken at a depth of nearly a hundred feet, without the use of artificial illumination. These localities abound in objects under water of great interest, such as shipwrecks. The fascinating art of taking pictures under water does not make it necessary for one to go to these places, for subjects are easily available. Whenever the submarine chamber is raised from the water there is an element of mystery involved, regarding what may be recorded on the plate or film, and this is an attractive feature of the diversion.

The Magic of Numbers

By JAMES L. LANYON

That there are a great many magic squares; that the numbers in these squares are arranged according to a definite system; that squares with very remarkable properties are easily constructed, are facts not generally known.

Consider the magic square A of 16 numbers. Add up any four numbers straight across, up and down, or diagonally—10 ways in all—and the sum in each case will be 34. But that is not all: Take the four numbers in any one quarter of the square, as for example, 15, 10, 4, and 5, and the sum will be 34; or take the four central numbers, or the four corner numbers, and the result will be the same. But even this does not exhaust the magic of the square. Add any four numbers arranged symmetrically around the center, as 3, 10, 8, and 13, or 10, 4, 7, and 13, and the result will also be 34. In fact, it is really not necessary to have them arranged symmetrically, because it will be found that four numbers arranged as are 6, 10, 11, and 7, or 1, 4, 16, and 13 will produce the same magic number of 34.

There are two other combinations of the 16 numbers that will give the same result. They are shown at B and C. In fact the second one, B, not only exhibits some of the former combinations, but also includes such sets of four as 14, 5, 3, and 12, or 15, 8, 2, and 9, which places to the credit of this square numerous combinations. Such special features as this simply add another element of mystery and interest. Thus, while the square B has these two combinations exclusively to its credit, the first, A, and the third, C, have such special arrangements as 5, 16, 1, and 12, or 15, 6, 11, and 2. Also 10, 3, 5, and 16, or 4, 5, 14, and 11, making the total number of such combinations for the first square 34.

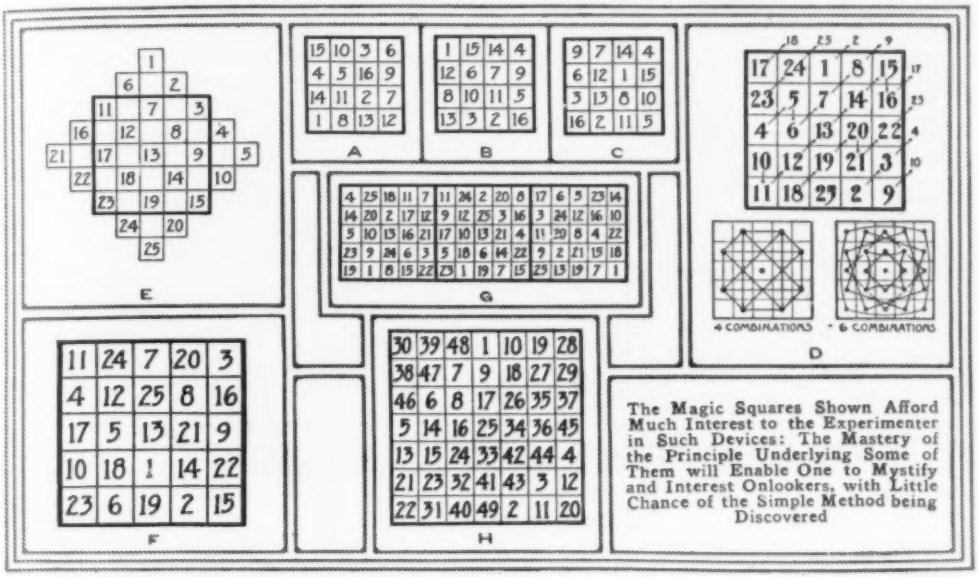
Magic squares of 25 numbers also have remarkable properties. Examine the square D and note the many possible combinations graphically set forth in the small diagrams. Not only do any five numbers in a row or along a diagonal make 65, but almost any four arranged around the center, with the center number 13 added, will give the same result.

This square is a good example by which to illustrate one of the methods of construction of these interesting devices. Thus, place 1 in the middle square of the top row, and then write the numbers down consecutively, always working in the direction of the arrows as indicated. When any number falls outside, as number 2 does at the start, drop down to the extreme square in the next row and insert the number there, as was done in this case. It will be observed that 4 falls outside, and so it is moved to the proper square

as suggested, which will be at the extreme left of the next row above. Continuing, it is found that at 6 it is necessary to drop down one square and continue in the direction of the arrows. At 9 it is necessary to drop down to the proper extreme square as shown. The next number, 10, must again be provided for at the square on the left of the next higher row. The square ahead being already filled, 11 is placed below; after this there is "clear sailing" for a time. In this manner magic squares with seven or nine numbers to the side may be made easily. When puzzles and catch problems are under discussion, it is always mystifying to take one's pencil and quickly make out a magic square according to this easily remembered method. The small diagrams at D suggest some of the combinations.

Another method of constructing a square of 25 numbers diagonally is shown at E. Place the outside numbers in the open spaces at the opposite side of the square, maintaining the same triangular relation, which results in the arrangement shown at F. While this combination is entirely different from the previous one, it exhibits the same mysterious properties.

Although they do not contain quite so many combinations, the three magic squares shown at G all add up to this same magic number of 65, straight across, diagonally, and many other ways. A square with seven numbers to the side, worked out according to the first method described, is illustrated at H. The magic number here is 175. Since the general principle is similar to that involved in the squares described in detail, the working out of the numerous combinations of the squares shown at G and H will be left to the interested experimenter.

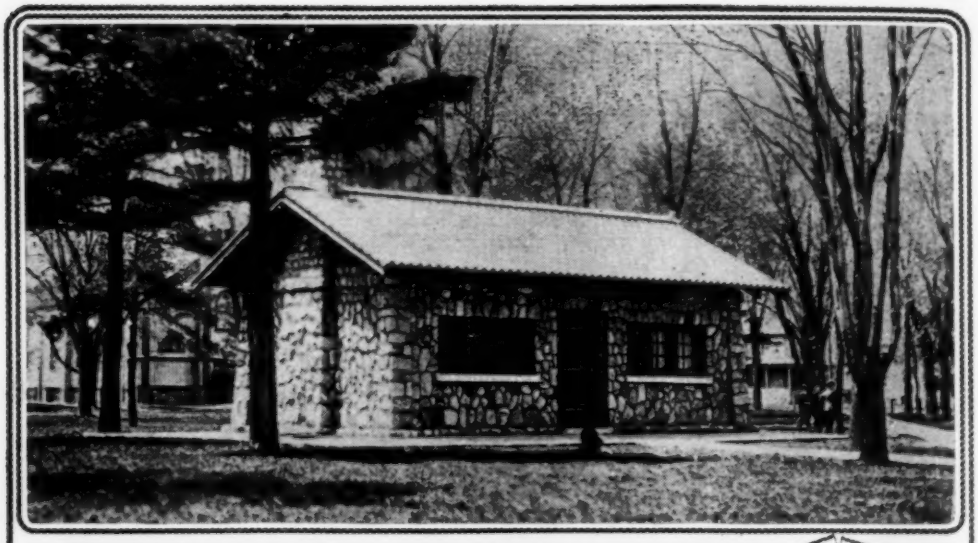

A
B
C
D
4 COMBINATIONS
6 COMBINATIONS
E
F
G
H
The Magic Squares Shown Afford Much Interest to the Experimenter in Such Devices: The Mastery of the Principle Underlying Some of Them will Enable One to Mystify and Interest Onlookers, with Little Chance of the Simple Method being Discovered

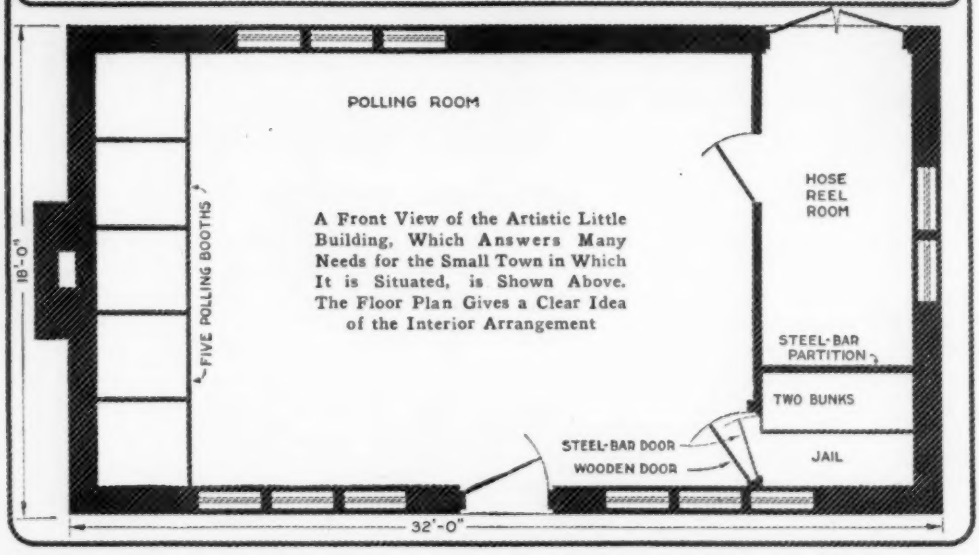
Muffling the Ticking of a Watch or Clock

When a watch is used on a table in the sick room, the ticking may be eliminated by placing an ordinary tumbler over the watch. The face may be seen readily. A large glass vessel, or transparent jar, may be used in the same way to cover a small clock.—L. E. Turner, Jamaica, N. Y.

¶To letter on prepared cloth, use colors ground in japan and thin the mixture with gasoline to the consistency of cream.

SMALL BUILDING SERVES MANY VILLAGE NEEDS





A Front View of the Artistic Little Building, Which Answers Many Needs for the Small Town in Which It is Situated, is Shown Above. The Floor Plan Gives a Clear Idea of the Interior Arrangement

ONE small boulder building, an artistic structure with overhanging eaves that give it a pleasing bungalow effect and suits it for the little wooded park in which it is situated, is made to serve several public functions for the town of Crystal Lake, in northeastern Illinois. It is interesting not as a novelty, but as an example of what a village can do with a modest appropriation by centralizing its departments. The structure does not house the administrative offices of the municipality, but serves as a pumping station, permanent polling place, branch jail and fire station, and a convenient park villa for picnic crowds and others. It is 32 ft. in length, 18 ft. wide, and roofed with green tile. Its basement is occupied by the pumping station, while the ground floor is so divided as to leave one large, well-lighted room for general public purposes. Along one end of this room are arranged five voting booths, and at the opposite extremity partitions divide a space 18 ft. long and about five and a half feet wide into a hose house and jail, the latter consisting of a single cell with two bunks, one above the other.

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